

Jobs for Nature impact assessment

Final Report

03 October 2024

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Preface

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

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Programme economic impacts

2024 Q4 update to the economic impacts

Purpose

This report is written for the Ministry for the Environment as in input into its assessment about the impact of the Jobs for Nature programme.

The Ministry's assessment of the programme will provide a knowledge base for government and community organisations to inform future investment and plan responses to biodiversity, freshwater management, and climate change challenges.

This report updates previous work

In 2023, we developed a methodology for a cost-benefit analysis (CBA) and economic impact assessment (EIA) to quantify the impact of the Jobs for Nature programme, and applied the methodology using a combination of historical and forecast information. Our work was summarised in a report to the Ministry in October 2023 'Jobs for Nature – Mahi mō te Taiao: Understanding economic impacts of the programme'.

In this report for 2024, we have updated the results for the CBA and EIA undertaken in 2023 using the full-year project spend and output volumes. The EIA was also updated with regional multipliers, which is further described below.

Update of the CBA results

Key assumptions:

- For 2023 Q4, costs are based on the full amount of budgeted funding being spent by 30 June, and 100% of potential benefits being realised.
- For 2024 Q4, results are based on the inputs used in 2023 Q4, with updated impact values and success rates. We have taken a conservative approach and assumed 80% of benefits are realised at the end of the programme. Appendix 1 summarises the impact values and success rates that we used in the analysis.

Note, the underlying impact assumptions used in 2024 were updated and some of the modelling adjusted. See 'Update of the CBA results' in Appendix 2 for further details.



Summary of results

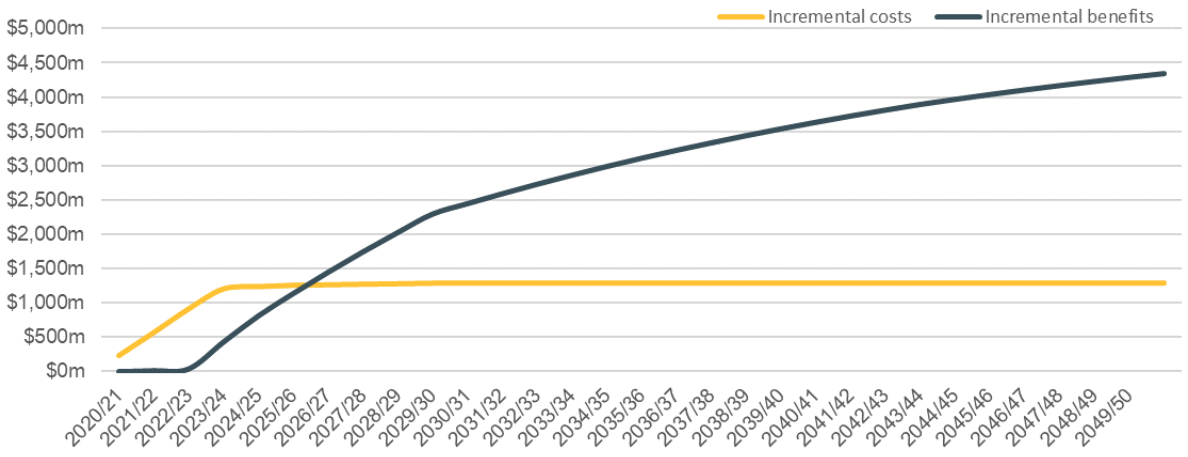
The table and graph below summarise the results of the CBA and provides the benefit cost ratio and payback period. The table shows how the results have changed over time as the reporting data has been updated.

Table 1: Summary of incremental costs and benefits ($000s)

High-level summary	2023 Q4 results	2024 Q4 results
Costs (PV)	$1,473,688	$1,170,133
Benefits (PV)	$3,620,910	$3,943,424
Net present value at 5%	$2,147,222	$2,773,291
Benefit Cost Ratio (BCR)	2.46	3.37
Payback period	7.004 years	5.279 years

Note: Costs include J4N project costs (from the programme funding), non-J4N costs (including other government funding and partner funding), and the deadweight cost of taxation. The decrease in the present value of costs is from J4N project costs, which for 2023 Q4 results were forecast based on the full project budget being spent. 2024 Q4 costs are based on actual project spend and is lower due to an overall underspend by the programme.

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



Benefits have increased, and the payback period has decreased, implying that expenditure has been targeted to higher-value activities over the past twelve months

The results indicate that although project expenditure has decreased in 2024 Q4 compared to the projected costs from 2023 Q4, the benefits have increased. This change could imply that funding was targeted at activities that

realised greater benefits as measured in the CBA. It also shows that a forecast programme overspend was avoided, noting there may still be some wash up payments.

The following table shows how the value of each of the three main benefit categories (economic, environmental, and wellbeing) have changed when compared to 2023. Subsequent tables then provide more detail about the makeup of each benefit category.

The main reason for the change in benefit values over time is changes to reported volumes – the same value and probabilities of benefits were applied in each reporting period, with some exceptions. In the final version of the model, changes were made to some benefits to reflect updates to impact amounts, success rates, or to adjust the dollar value of benefits to the equivalent of the 2021 financial year price.

Table 2: Incremental benefits ($000s)

Benefit summary	2023 Q4 results	2024 Q4 results
Project benefits (10-year NPV)	$2,230,970	$2,221,752
Economic benefits (30-year NPV)	$1,175,611	$914,535
Environmental benefits (30-year NPV)	$2,012,584	$2,772,538
Wellbeing benefits (30-year NPV)	$432,715	$256,351
Total incremental benefits (30-year NPV)	**$3,620,910**	**$3,943,424**

Note: Overall, an 80% benefit scaling was applied to 2024 Q3 results as analysis was based on actual costs to date, and our previous scenario assumed that not all benefits would be realised. This 80% scaling was also applied to 2024 Q4 results in order to be conservative about programme impacts. In comparison, 2023 Q4 results (for scenario 1) assumed 100% of benefits would be realised because costs were forecast to equal the programme budget.

Table 3: PV of economic benefits ($000s)

Economic benefit	2024 update	2023 Q4 results	2024 Q4 results
Avoided flood damage	Converting value of avoided harm from USD to NZD, correcting impact year	$5,125	$8,277
Reduced stock loss in waterways		$1,575	$1,003
Improved productivity for farmers due to reduced competition for grazing	Updating success rate	$170,615	$242,323
Reduced costs to the agricultural sector and government associated with pest control	Updating impact value	$203,909	$218,639
Avoided irrigation losses		$215,665	$232,980
Avoided hydro losses		$268,451	$290,004
Improved agricultural productivity	Updating impact value and success rate – a more conservative measure	$140,234	$22,869
Reduced pasture damage from possums	Updating success rate	$1,218	$1,474

Economic benefit	2024 update	2023 Q4 results	2024 Q4 results
Reduced youth unemployment	Updating the impact value used in CBAx	$168,818	$125,599

Table 4: PV of environmental benefits ($000s)

Environmental benefit	2024 update	2023 Q4 results	2024 Q4 results
Increased carbon sequestration	Updating value used in CBAx and success rate	$36,177	$42,189
Improved water quality	Correcting impact value year	$43,784	$58,674
Improved biodiversity	Updating the impact value used in CBAx	$324,728	$447,928
Improved water clarity	Updating the impact value used in CBAx	$43,784	$39,116
Soil retention	Updating impact value	$5,212	$7,312
Reduced water treatment costs	Correcting impact value year	$1,355,994	$2,648,820
Reduced fire risks		$156,871	$169,466
Avoided costs associated with managing biofouling	Correcting impact value year	$46,035	$52,168

Table 5: PV of wellbeing and other benefits ($000s)

Wellbeing and other benefits	2024 update	2023 Q4 results	2024 Q4 results
Improved recreational value		$937	$937
Aesthetic appeal	Updating average conversion rate used for pound sterling to NZD	$8,391	$8,113
Reduced human health risks	A significant reduction in the reported amount of fencing constructed / maintained	$161,963	$49,965
Improved cultural values		$184,429	$184,429
Increase in fish catch		$76,995	$76,995

Update of the EIA results

Summary of results

The EIA used an updated approach to improve the estimate of the programme impact at a local, or regional level by using regional multipliers (these are provided below for reference).

The following table shows the estimated economic output and employment for direct, indirect, and induced impacts at a national level. 2023 results are calculated using national rates, compared to 2024 results which are calculated regionally.

Table 6: Total economic impact assessment ($000s)

National	Direct	Indirect	Induced	Direct + Indirect	Direct + Indirect + Induced
Output ($000s) 2023 Q4	$557,502	$466,882	$411,498	$1,024,385	$1,435,883
Output ($000s) 2024 Q4	$762,580	$434,262	$293,877	$1,196,842	$1,490,719
Employment (FTEs) 2023 Q4	6,516	4,258	2,781	10,774	13,555
Employment (FTEs) 2024 Q4	4,857	2,526	1,473	7,383	8,856

The next table shows the estimated economic impact and employment at a regional level.

Table 7: Economic impact assessment by region ($000s) – 2024 Q4 results

Region	Programme expenditure	Economic output benefits (direct + indirect + induced)	Estimated FTEs (direct +indirect + induced)
Auckland	$21,997.82	$40,068.93	183
Bay of Plenty	$89,688.62	$171,017.11	830
Canterbury	$128,098.57	$265,848.15	1,219
Gisborne/Tairāwhiti	$35,598.88	$61,381.76	344
Hawkes Bay	$31,903.46	$60,423.03	340
Manawatū-Whanganui	$49,436.89	$89,608.90	499
Marlborough	$25,803.04	$44,381.21	273
Tasman-Nelson	$28,790.37	$50,606.18	359
Northland	$49,571.27	$89,852.46	500

Region	Programme expenditure	Economic output benefits (direct + indirect + induced)	Estimated FTEs (direct +indirect + induced)
Otago	$53,740.28	$103,183.16	491
Southland	$30,929.55	$51,084.75	238
Taranaki	$19,057.94	$29,885.49	107
Waikato	$39,752.69	$75,953.01	367
Wellington	$23,522.67	$38,428.76	267
West Coast	$22,901.31	$36,048.00	174
Chatham Islands	$3,519.75	$4,099.46	34
Regional total	**$654,313.10**	**$1,211,870.35**	**6,224**
Nationwide	$232,145.05	$278,848.72	2,632
Total	**$886,458.16**	**$1,490,719.07**	**8,856**

Use of the regional output multipliers in the EIA

As noted above, the EIA is based on 2019/20 regional output multipliers for agriculture, forestry, and fishing support services.[1, 2]

Given the nature of the investment in the Jobs for Nature programme, we used regional output, instead of regional value add, multipliers. The output multipliers are listed below and show the value of the programme's investment in different regional economies.

While value add multipliers were not used, we have included these in the end table for your reference.

Table 8: Output multipliers by region (used in our analysis)

Region	Direct impact	Indirect impact	Induced impact	Direct + Indirect+ induced
Auckland	1.00	0.43	0.39	1.82
Bay of Plenty	1.00	0.57	0.34	1.91
Canterbury	1.00	0.64	0.44	2.08
Gisborne/Tairāwhiti	1.00	0.47	0.25	1.72

1 Chatham Islands does not have data for some relevant industries, so we used the repair and maintenance multiplier to reflect the effort that went into fencing across the projects in this region.

2 Employment in Wellington also uses the national multiplier as the regional multiplier is disproportionately impacted by the categorisation of local economic data.

Region	Direct impact	Indirect impact	Induced impact	Direct + Indirect+ induced
Hawkes Bay	1.00	0.56	0.34	1.90
Manawatū-Whanganui	1.00	0.51	0.30	1.81
Marlborough	1.00	0.49	0.23	1.72
Tasman-Nelson	1.00	0.44	0.31	1.75
Northland	1.00	0.51	0.30	1.81
Otago	1.00	0.57	0.35	1.92
Southland	1.00	0.44	0.21	1.65
Taranaki	1.00	0.37	0.20	1.57
Waikato	1.00	0.57	0.34	1.91
Wellington	1.00	0.35	0.29	1.64
West Coast	1.00	0.37	0.20	1.57
Chatham Islands	1.00	0.07	0.10	1.17
Nationwide*	0.47	0.39	0.34	1.20

* The value added multiplier has been used for nationwide project spend.

Table 9: Value added multipliers by region (only used for employment, excluding Wellington which used the nationwide rate)

Region	Direct impact	Indirect impact	Induced impact	Direct + Indirect+ induced	Direct FTE	Indirect FTE	Induced FTE
Auckland	0.47	0.21	0.22	0.90	5.1	1.8	1.4
Bay of Plenty	0.47	0.27	0.19	0.93	5.2	2.6	1.4
Canterbury	0.47	0.30	0.25	1.01	4.9	2.9	1.8
Gisborne/Tairāwhiti	0.47	0.22	0.15	0.84	5.8	2.6	1.2
Hawkes Bay	0.47	0.26	0.20	0.93	6.2	3.0	1.5
Manawatū-Whanganui	0.47	0.24	0.18	0.88	6.1	2.7	1.4
Marlborough	0.47	0.23	0.14	0.83	6.8	2.7	1.1
Tasman-Nelson	0.47	0.21	0.18	0.86	8.6	2.4	1.5

Region	Direct impact	Indirect impact	Induced impact	Direct + Indirect+ induced	Direct FTE	Indirect FTE	Induced FTE
Northland	0.47	0.24	0.18	0.88	6.1	2.7	1.4
Otago	0.47	0.27	0.20	0.93	4.9	2.7	1.5
Southland	0.47	0.20	0.13	0.79	4.9	1.9	0.8
Taranaki	0.47	0.17	0.12	0.76	3.3	1.5	0.8
Waikato	0.47	0.26	0.19	0.92	5.2	2.6	1.4
Wellington	0.47	0.16	0.17	0.80	34.0	1.8	1.0
West Coast	0.47	0.17	0.12	0.76	4.9	1.8	0.9
Chatham Islands	0.54	0.02	0.07	0.63	9.3	0.2	0.2
Nationwide	0.47	0.39	0.34	1.20	5.5	3.6	2.3

Agency-level results

The Jobs for Nature programme includes project funding managed by the Department of Conservation (DOC, 48% of project spend), Ministry for the Environment (MFE, 23%), Ministry for Primary Industries (MPI, 20%), LINZ (5%), and Kānoa – Regional Economic Development & Investment Unit (4%).

Agency-level results have been calculated for MFE and DOC as the agencies with the greatest proportion of programme funding. We note that MPI have done in-house reviews of the impact of their projects, and the amount of funding distributed through LINA and Kānoa is relatively small.

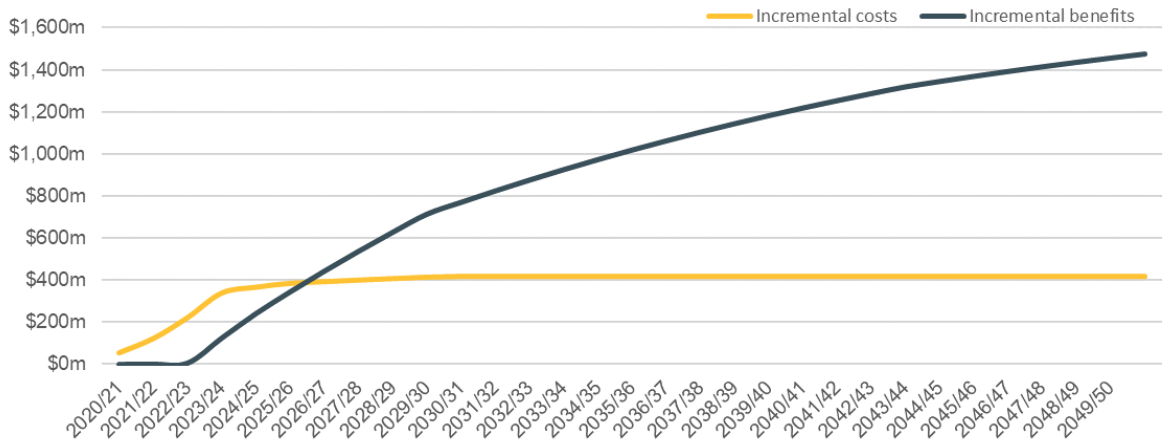
Ministry for the Environment-only results

Update of the CBA (MFE)

Table 10: MFE summary of incremental costs and benefits ($000s) – 2024 Q4

High-level summary	All agencies	MFE only
Costs (PV)	$1,170,246	$376,883
Benefits (PV)	$3,943,424	$1,338,624
Net present value (NPV) at 5%	$2,773,178	$961,742
Benefit Cost Ratio (BCR)	3.37	3.55
Payback period	5.279 years	6.016 years

Figure 2: MFE incremental costs and benefits over time (real 2020/21 dollars)



EIA results (MFE)

Table 11: MFE total economic impact assessment ($000s) –2024 Q4

National	Direct	Indirect	Induced	Direct + Indirect	Direct + Indirect + Induced
Output ($000s) all agencies	$762,680	$434,306	$293,909	$1,196,986	$1,490,895
Output ($000s) MFE only	$161,945	$94,598	$67,470	$256,544	$324,014
Employment (FTEs) all agencies	4,858	2,526	1,473	7,384	8,858
Employment (FTEs) MFE only	1,152	619	370	1,771	2,142

Table 12: MFE economic impact assessment by region ($000s) – 2024 Q4

Region	Programme expenditure	GDP benefits (direct + indirect + induced)	Estimated FTEs (direct +indirect + induced)
Auckland	$7,547	$13,747	63
Bay of Plenty	$14,854	$28,324	137
Canterbury	$6,687	$13,878	64
Gisborne/Tairāwhiti	$7,843	$13,524	76
Hawkes Bay	$9,633	$18,243	103
Manawatū-Whanganui	$15,890	$28,802	160

Region	Programme expenditure	GDP benefits (direct + indirect + induced)	Estimated FTEs (direct +indirect + induced)
Marlborough	$4,495	$7,732	48
Tasman-Nelson	$8,615	$15,143	108
Northland	$9,135	$16,558	92
Otago	$9,581	$18,396	88
Southland	$2,981	$4,924	23
Taranaki	$6,316	$9,904	35
Waikato	$9,543	$18,233	88
Wellington	$8,558	$13,981	97
West Coast	$1,084	$1,706	8
Chatham Islands	$0	$0	0
Regional total	**$122,762**	**$223,095**	**1,189**
Nationwide	$84,016	$100,919	953
Total	**$206,778**	**$324,014**	**2,142**

National results are based on value added. Regional results are based on outputs, noting regional value-added multipliers overly discount for flows from internal transactions.

Department of Conservation-only results

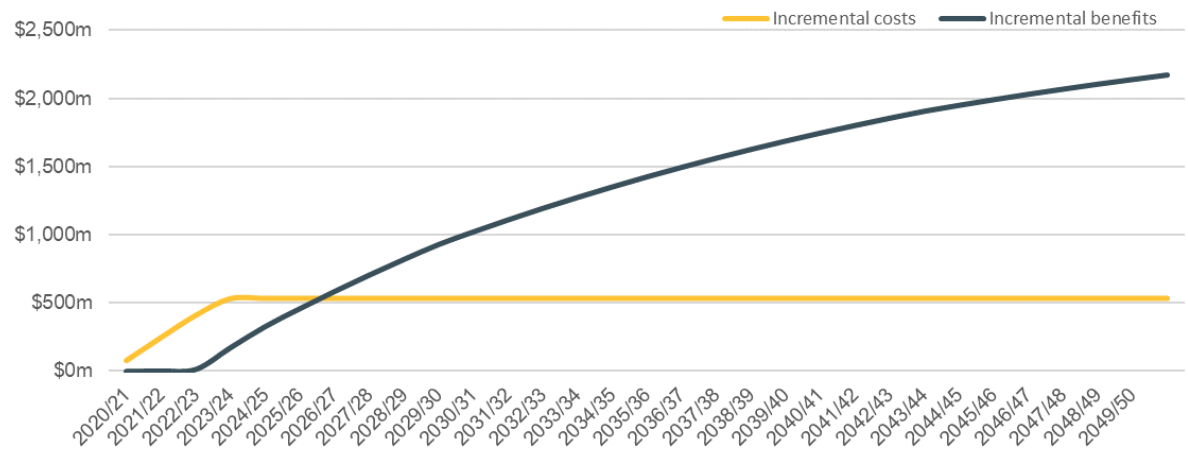
Update of the CBA (DOC)

Table 13: DOC summary of incremental costs and benefits ($000s) – 2024 Q4

High-level summary	All agencies	DOC only
Costs (PV)	$1,170,246	$483,230
Benefits (PV)	$3,943,424	$1,971,089
Net present value (NPV) at 5%	$2,773,178	$1,487,859
Benefit Cost Ratio (BCR)	3.37	4.08
Payback period	5.279 years	6.029 years



Figure 3: DOC incremental costs and benefits over time (real 2020/21 dollars)



EIA results (DOC)

Table 14: DOC total economic impact assessment ($000s) –2024 Q4

National	Direct	Indirect	Induced	Direct + Indirect	Direct + Indirect + Induced
Output ($000s) all agencies	$762,680	$434,306	$293,909	$1,196,986	$1,490,895
Output ($000s) DOC only	$359,633	$202,354	$137,773	$561,987	$699,760
Employment (FTEs) all agencies	4,858	2,526	1,473	7,384	8,858
Employment (FTEs) DOC only	2,338	1,208	705	3,546	4,252

Table 15: DOC economic impact assessment by region ($000s) – 2024 Q4

Region	Programme expenditure	GDP benefits (direct + indirect + induced)	Estimated FTEs (direct +indirect + induced)
Auckland	$13,431.09	$24,464.67	111
Bay of Plenty	$58,586.41	$111,711.82	542
Canterbury	$37,762.31	$78,369.66	359
Gisborne/Tairāwhiti	$19,623.74	$33,836.45	190
Hawkes Bay	$15,871.01	$30,058.63	169

Region	Programme expenditure	GDP benefits (direct + indirect + induced)	Estimated FTEs (direct +indirect + induced)
Manawatū-Whanganui	$19,486.43	$35,320.94	197
Marlborough	$7,435.16	$12,788.46	79
Tasman-Nelson	$13,123.39	$23,067.59	164
Northland	$27,925.71	$50,617.90	282
Otago	$15,633.63	$30,017.10	143
Southland	$13,837.11	$22,854.05	107
Taranaki	$10,983.35	$17,223.41	62
Waikato	$14,957.59	$28,578.54	138
Wellington	$12,203.78	$19,937.19	138
West Coast	$18,237.35	$28,706.64	138
Chatham Islands	$2,625.96	$3,058.47	25
Regional total	**$301,724.02**	**$550,611.55**	**2,844**
Nationwide	$124,168.17	$149,148.71	1,408
Total	**$425,892.19**	**$699,760.27**	**4,252**

National results are based on value added. Regional results are based on outputs, noting regional value-added multipliers overly discount for flows from internal transactions.

Appendix 1: Impact assumptions

The appendix summarises the impacts (or benefits) realised by the Jobs for Nature programme and how they are applied in the CBA. We have assumed that all impacts in the economic, environmental, and wellbeing categories have a 3-year lag before being realised, except for reduced unemployment which has a 1-year lag. All dollar amounts are adjusted to 2021 financial year values (the year the programme started).

Economic benefits

Impact	Value	Success rate	How the impact is applied
Avoided flood damage	The Nature Conservancy found that every dollar invested in floodplain conservation returns at least $5 in savings from avoided flood damages.[3] This is equal to NZ**$7.69 in 2020**, based on a 0.65 average closing price for the year.[4]	**11%** of residential properties in New Zealand are exposed to river flooding.[5] **One third** of at-risk properties are assumed to have avoided flood damage.	**Population growth** is assumed to drive occupancy of at-risk residential properties. 3.83% (one third of 11%) of the annual population growth are assumed to benefit from at least $1 of J4N work on floodplain conservation each.
Reduced stock loss in waterways	Stock is valued according to the National Standard Cost, provided by Inland Revenue, using the Rising 1-year beef cattle rate.[6] This is equal to **$495.30 in 2023**.	**10%** is used, assuming one cattle loss is avoided per year per 10km of fencing work done.	**Fencing (km)** reported is used, including new fencing, fencing maintained, riparian fencing, not riparian fencing, and new fencing constructed or existing fencing maintained.
Improved productivity for farmers due to reduced competition for grazing	The net value of agriculture ecosystems was calculated as $12.421b across 7,714,688 ha in 2012.[7] This is equal to a net value of **$1,610 per ha in 2012**.	**12.73%** is used. This is calculated by a 90% reduction in wallaby numbers for every hectare treated[8], an assumption that 8.125% of area reported is unique, and that a 1.741 production loss multiplier[9] is avoided.	**Area covered by farm environment plans completed (ha)** is used, assuming that environment plans are focused, at least in part, on improving productivity through reducing competition for grazing. It is also assumed that grazing competition responses are at least as effective as wallaby treatment, noting different

[3] https://www.nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/climate-change-stories/natures-potential-reduce-flood-risks/

[4] https://www.macrotrends.net/2557/new-zealand-us-dollar-exchange-rate-historical-chart

[5] https://www.rnz.co.nz/news/national/473366/river-flooding-costs-upwards-of-100m-a-year-and-rising-report

[6] https://www.taxtechnical.ird.govt.nz/determinations/livestock/standard-costs/nsc-2023

[7] https://www.landcareresearch.co.nz/assets/Publications/Ecosystem-services-in-New-Zealand/3_2_Patterson.pdf

[8] https://www.mpi.govt.nz/dmsdocument/11764-Review-of-current-and-future-predicted-distributions-and-impacts-of-Bennetts-and-dama-wallabies-in-mainland-New-Zealand

[9] https://www.mpi.govt.nz/dmsdocument/48496-Economic-costs-of-pests-to-New-Zealand-Technical-report

Impact	Value	Success rate	How the impact is applied
			regions will be responding to different issues.
Reduced costs to the agricultural sector and government associated with pest control	In 2019-20 the total defensive expenditure (cost of pest management in the primary sector) was $1.46b (ex GST).[10] Based on the reported costs by pest type, 20% of this is the cost of vertebrates. Based on size of the agricultural ecosystem[11] this equals to **$38 per ha in 2020**.	**25%** is assumed to reflect the avoided expenditure for pest management going forward as a result of the pest population management projects.	**Pest control – animals (ha)** reported is used, including area treated for possums, rats and/or mustelids, goats, deer, wallabies, other animal pests, and animal pest control completed.
Avoided irrigation losses	In research that estimated the impact of wilding conifers on irrigation in Otago, this was assumed to be worth **$19.08 per ha infested by wildings in 2018**.[12] This rate is used as a proxy for all regions.	**100%** is assumed as the success rates have been considered in the value of the impact in the research, and the only the areas treated for wilding conifers are considered.	**Area treated for wilding conifers (ha)** is used. This impact will be significant in Canterbury and Otago which make up 64% and 13.5% of New Zealand's total irrigated land area (735,000 ha).
Avoided hydro losses	In research that also estimated the hydro impact of wilding conifers in Otago, this was assumed to be worth **$23.75 per ha infested by wildings in 2018**.[13] This rate is used as a proxy for all regions.	**100%** is assumed as the success rates have been considered in the value of the impact in the research, and the only the areas treated for wilding conifers are considered.	**Area treated for wilding conifers (ha)** is used. Hydro impacts are significant for areas of major hydro resource which are vulnerable to impacts from wilding invasion.
Improved agricultural productivity	Pest plants including giant buttercup, Californian thistle, gorse, blackberry, forestry, and powdery mildew in 2020 each costed from $8m to $722m annually in production losses.[14] Across the 7.7m ha of agricultural ecosystems, this on average equals to **$30 per ha in 2020**.	**14.15%** is used. This assumes that 8.125% of area reported is unique and that a 1.741 production loss multiplier[15] is avoided.	**Area treated for weeds (ha)** is used. The value assumes an average of the cost for a range of species, noting there is no detail on what weeds have been treated.

[10] See 9

[11] See 7

[12] https://landwaterpeople.co.nz/wp-content/uploads/2020/01/Otago-RPMP-cost-benefit-analysis-1-november-2018.pdf

[13] See 12

[14] See 9

[15] See 9



Impact	Value	Success rate	How the impact is applied
Reduced pasture damage from possums	Possums in 2020 were calculated as costing $29m annually in production losses.[16] Across the 7.7m ha of agricultural ecosystems, this on average equals to **$4 per ha in 2020**.	**14.15%** is used. This assumes that 8.125% of area reported is unique and that a 1.741 production loss multiplier[17] is avoided.	**Area treated for possums (ha)** is used to consider the avoided production losses from damage caused by possums. This measure is distinct from reduced costs for pest control, which considers the pest management costs saved for farmers and landowners from efforts through the programme to control pest populations.
Reduced youth unemployment	The cost of youth unemployment is based on the Youth payment in Treasury's CBAx[18] calculated on the basis of a proportion of jobs going to youth who otherwise would have been unemployed. This equals **$15,297 per year in 2023**.	**25%** of employment starts are assumed to be taken up by youth.	Cumulative **employment starts** each year is used to approximate the total incremental FTEs opportunities created with programme expenditure. These are included for the duration of the programme with a 1-year lag.

Environmental benefits

Impact	Value	Success rate	How the impact is applied
Increased carbon sequestration	The value of CO2 sequestration per tree is calculated by assuming 10 tCO2 per ha per year is reduced over 50 years, [19] that Treasury's CBAx gives a shadow emissions value central price path per tCO2 up to 2030 of $181 in 2023,[20] and that there are 1,400 trees planted per ha.[21] This gives a value of **$1.29 per tree in 2023**.	**100%** is assumed, noting the value is calculated conservatively with the low end of CO2 sequestration per ha, and high end of planting density.	**Number of trees planted** is used, with a calculated value of carbon sequestration per year applied.
Improved water quality	The value is based on the willingness to pay for a % point	**10%** is assumed on the basis that it takes 10	**Population growth** is used to drive the number of people

[16] See 9

[17] See 9

[18] https://www.treasury.govt.nz/publications/guide/cbax-spreadsheet-model

[19] https://climateandnature.org.nz/wp-content/uploads/2022/09/1Carbon-Sequestration-by-Native-Forest%E2%80%93Setting-the-Record-Straight.pdf

[20] See 18

[21] https://www.forestenterprises.co.nz/wp-content/uploads/2018/02/GuidetoForestry.pdf

Impact	Value	Success rate	How the impact is applied
	increase in water quality in terms of ecological quality (MCI score) per person in Treasury's CBAx. [22] This equal **$6 per person in 2015**.	years for interventions to realise the full benefits of improved water quality.[23]	benefitting from increased water ecological quality, which is given as a per person value.
Improved biodiversity	This value is based on the willingness to pay to prevent the extinction of up to 10 susceptible native species.[24] This equals **$101 per person in 2017**.	**5%** is assumed. Further data will be needed on at risks species protected to explore the impact.	**Population growth** is used to drive the number of people valuing avoided extinction of native plants and animals, which is given as a per person value.
Improved water clarity	The value is based on the willingness to pay for a % point increase in water quality based on water clarity (visibility between 1.2m and 2.4m) per person in Treasury's CBAx.[25] This equal **$4 per person in 2015**.	**10%** is assumed on the basis that it takes 10 years for interventions to realise the full benefits of improved water quality.[26]	**Population growth** is used to drive the number of people benefitting from increased water clarity, which is given as a per person value.
Soil retention	As topsoil is the main limited resource lost. Top soil costs $69.56 per m^3 excluding GST.[27] There are 0.67m^3 per tonne of topsoil.[28] This gives topsoil a value of **$417.39 per nine tonnes in 2023**.	**25%** of 9 tonnes of avoided soil loss per ha per year as a result of riparian planting is assumed to be topsoil.[29]	**Freshwater restoration (ha)** reported is used, including area of riparian strip restored by plantings, freshwater area under active restoration, and area of riparian / lake / wetlands planting complete.
Reduced water treatment costs	The value is based on the cost of replacing wetland ecosystem services with physical infrastructure in Treasury's CBAx.[30] This equals **$50,000 per ha per year in 2019**.	**100%** is assumed assuming freshwater restoration is full effective.	**Freshwater restoration (ha)** reported is used, including area of riparian strip restored by plantings, and freshwater area under active restoration.
Reduced fire risks	Research on the Benefits and Costs of Additional Investment in Wilding Conifer Control assumes that wildfire risk is not removed	**100%** is assumed, with the value factoring in the success rate of reduced fire risk.	**Area treated for wilding conifers (ha)** reported is used. This links to the basis used in the

[22] See 18

[23] https://environment.govt.nz/assets/Publications/Files/essential-freshwater-package-benefits-analysis.pdf

[24] See 18

[25] See 18

[26] See 23

[27] https://www.landscapesupplyco.nz/product/screenedtopsoil1m3/?v=c97b334ffd41

[28] https://www.rolawn.co.uk/information-advice/topsoil/choosing-topsoil/calculating-requirements/

[29] https://www.mtm.ac.nz/wp-content/uploads/2017/12/FINAL-PUBLISHED-REPORT-WAIWIRI-CBA-cover.pdf

[30] See 18



Impact	Value	Success rate	How the impact is applied
	entirely by wilding conifer control but it results in a reduction in future suppression costs and associated damages which is deemed a reasonable assumption.[31] It values the benefit as **$6.24 per ha controlled per year in 2021**.		research on benefits for controlling wilding conifers.
Avoided costs associated with managing biofouling	The direct economic costs of managing biofouling in the aquaculture industry are estimated to be 5–10% of production costs.[32] Aquaculture production costs were estimated at between $7000-$9000 per ha with a mid-value of $8000 per ha.[33] Cost of managing biofouling therefore ranges from $400 to $800 per ha. Using the low end, it is valued at $400 per ha in 2012.	50% is assumed, based on the rate of biofouling on aquaculture equipment due to invasive species.[34]	**Area where aquatic weeds were controlled (ha)** reported is used.

[31] https://www.mpi.govt.nz/dmsdocument/58519/direct

[32] https://testbiofouling.imo.org/wp-content/uploads/2024/05/Aquaculture-report.pdf

[33] See 7

[34] https://nzaquaculture.co.nz/old-archives/AC42.pdf

Wellbeing benefits

Impact	Value	Success rate	How the impact is applied
Improved recreational value	Recreational value is based on the marginal willingness to pay for campgrounds and huts. [35] This equals **$5.58 per person in 2013**.	**2.5%** is assumed. Studies suggest that the expected annual increase in visitor numbers resulting from maintenance of recreational facilities ranges from 1% to 5% depending on factors such as the type of facility, quality of maintenance, popularity and the local demographics.[36] [37]	**Recreational visitors** are assumed to benefit from improved access to nature.
Aesthetic appeal	The aesthetic benefit of afforestation is estimated £42/ha/year in 2018.[38] This is equal to NZ**$7.69 in 2020**, based on an average exchange rate of 1.9289 for the year.[39]	**100%** is assumed.	**Ecosystem restoration (ha)** reported is used, including area restored by plantings, area of afforestation or other biodiversity planting, area under active restoration, and area of planting for erosion control completed.
Reduced human health risks	Studies show that fencing works especially well reducing of E. coli that can result from animal waste and which in turn poses human health risks. The Essential Freshwater Package Benefit Analysis estimated the reduced risk of infection for swimmers at $138 million per annum for the fencing of 32,000 km of waterways[40] which equates to a reduced human health risk	62% is the median value of E. coli removal as a result of fencing.[41]	**New fencing constructed or existing fencing maintained (km)** reported is used.

[35] https://ageconsearch.umn.edu/record/152163/?ln=en&v=pdf

[36] https://www.doc.govt.nz/globalassets/documents/about-doc/role/visitor-research/visitor-insights-report-2020-2021.pdf

[37] https://ageconsearch.umn.edu/record/152163/?ln=en&v=pdf

[38] https://onlinelibrary.wiley.com/doi/epdf/10.1111/jfr3.12482

[39] https://www.exchangerates.org.uk/GBP-NZD-spot-exchange-rates-history-2018.html

[40] https://environment.govt.nz/assets/Publications/Files/action-for-healthy-waterways-information-on-benefits-and-costs.pdf

[41] https://www.mcguinnessinstitute.org/wp-content/uploads/2021/12/2017-09-Effectiveness-of-fencing-AgResearch-Report.pdf

Impact	Value	Success rate	How the impact is applied
	benefit of **$4,313 per kilometre of fencing in 2021**.		
Improved cultural values	The willingness to pay for Māori cultural attributes is estimated at between $140 and $180 per person,[42] with an average of **$160 per person in 2021**.	**10%** is assumed as a proxy for the reach of projects focused on cultural values in their approach or outcomes.	**Māori population** is used, assuming cultural values, while important to many New Zealanders, we assume that there is a net off between Māori people that do not value cultural attributes and non-Māori that do.
Increase in fish catch	Studies show that improved water quality can increase the availability of fish populations by up to 50%.[43] Research estimates that the WTP for additional fish caught ranges from $1.61 to $19.76/angler/year.[44] The median value was **$5.73 in 2001**.	**7%** is assumed to reflect the percentage of the population that fish. It is estimated that 14% of the population participates in recreational fishing per annum with participation in freshwater fishing estimated at 8%.[45] 348,000 estimated recreational fishers as at 2017/18, for a proportion of 6.94% of the population.[46]	**Population growth** is assumed to reflect the increase in people benefiting from fishing with increased fish populations.

[42] https://environment.govt.nz/assets/Resource-Economics-Report.pdf

[43] https://docs.niwa.co.nz/library/public/NIWAsts53.pdf

[44] https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8489.00159

[45] https://www.mpi.govt.nz/news/media-releases/new-survey-measures-recreational-fishing/

[46] https://legasea.co.nz/2015/06/29/important-research-into-recreational-fishing/

Appendix 2: Analysis detail

Adjustments to the data

The programme has made some retrospective adjustments to the quarterly reporting of project spend (shown in the table below). The analysis in this report is based on the costs reported in 2024 Q4.

Table 16: J4N project costs with retrospective adjustments

$ million	2020/21	2021/22	2022/23	Total
2023 Q4 results	$170,654	$242,637	$224,605	$637,896
2024 Q3 results	$169,970	$235,082	$255,593	$660,645
2024 Q4 results	$170,070	$234,820	$257,279	$662,169

Since 2023 Q4, 28 new projects were added to the dataset that we used, with project approval dates ranging from September 2021 to November 2023. A summary of the new projects added to the reporting are listed below.

Table 17: New projects added

Agency	Project Id	Project Name
DOC	AL07.14	He Hononga Taiao Sustainability and Resilience
MFE	TMOTW370W	Me he wai tā tīeke:wai monitoring and management programme for Ngāti Rangi
MFE	ARC05	ARC Envelope[47]
MFE	EFF1020e	EFF1020 Envelope
MFE	EFF1021e	EFF1021 Envelope
MFE	JfNSec	JfN Programme close down
MFE	EFF1222	Ngāti Whātua Orakei Whai Māia Charitable Trust
MFE	EFF1200	Whakatōhea Māori Trust Board (Opotiki)
MFE	EFF1207	Ngā Pōtiki a Tamapāhore Trust (Papamoa)
MFE	EFF1213	Ngā Kaimahi Whenua ō Ngāti Ira Charitable Trust (Opotiki)
MFE	EFF1203	The Rongowhakaata Iwi Trust (Manutuke)
MFE	EFF1209	Te Aitanga a Māhaki Trust (Gisborne)

[47] Projects with 'envelope' in their name refer to bundles of funding used for a range of activities within a project. ARC refers to At Risk Catchments, and EFF refers to Essential Freshwater Fund.

MFE	EFF1219	Te Iwi o Rakaipaaka Inc. (Nūhaka)
MFE	EFF1220	Rongomaiwahine Iwi Charitable Trust (Māhia)
MFE	EFF1208	Te Roroa Mana Whenua & Whatu Ora Trusts (Waipoua)
MFE	EFF1211	Te Rūnanga o Te Rarawa (Kaitaia)
MFE	EFF1217	Ngāti Kahu Corporate Ltd (Kaitaia)
MFE	EFF1218	Te Rūnanganui o Te Aupouri (Kaitaia)
MFE	EFF1221	Ngāti Kuri Trust Board (Kaitaia)
MFE	EFF1201	Hokonui Rūnanga Kaupapa Taiao (Gore)
MFE	EFF1216	Te Kāhui Maru Trust (Stratford)
MFE	EFF1212	Kaikaiawaro Charitable Trust for Te Rūnanga o Ngāti Kuia (Nelson)
MFE	EFF1202	Te Kotahitanga o Ngāti Tūwharetoa (Tūrangi/Taupō)
MFE	EFF1204	Ngāti Hauā Iwi Trust (Morrinsville)
MFE	EFF1205	Ngāti Tarāwhai Iwi Trust (Rotorua)
MFE	EFF1214	Rangiwewehi Charitable Trust (Rotorua)
MFE	EFF1215	Te Kōmiti Nui o Ngāti Whakaue (Rotorua)
MFE	EFF1223	Raukawa Marae Management Committee
MFE	ARC04	Whanganui West Catchment Group

There were also seven projects removed from the programme reporting. Two of these projects had funding allocated in the previous quarter, but none had incurred any project expenditure.

Table 18: Removed projects

Agency	Project Id	Project Name	Q3 funding
MFE	EFF1051	Tangata Whenua	$4,500,000
MPI-AIS	MPIAISEFF009	Waiotahe Water Care	$400,000
MFE	EFF1014	Integrated Catchment Management Plans - Envelope	$0
MFE	EFF1025	ICMP tbc/Horowhenua ICMP?	$0
MFE	EFF1027	Hawke's Bay ICMP	$0
MFE	EFF1060	Nature based Solutions (envelope)	$0
DOC	AL08.15	Ngaa Taaonga Tuku Iho me te Aarai Taiao oo Te Puuaha	$0



There also appears to have been changes to the value of two funding streams, shown below. Overall, this reflects a $13.9 million reduction in funding in the programme's final quarter.

Table 19: Funding stream changes – amounts

Funding Stream ID	Fund Or Programme Name	Q3 funding	Q4 funding
MFE_Admin	J4N Admin (MfE)	$36,262,202	$35,326,143
MFE_PW	Essential Freshwater Fund	$144,508,016	$131,508,016

In addition to the above variations, we applied a consistent spelling of Hawke's Bay in the regional data in order for calculations to work properly in the CBA model.

Update of the CBA results

Summary of results

The table and graph below summarise the results of the CBA and provides the benefit cost ratio and payback period. The table shows how the results have changed over time as the reporting data has been updated.

Table 20: Q4 comparison – PV of economic benefits ($000s)

Economic benefit	2024 update	2023 Q4 results	2024 Q4 results	2024 Q4 results - updated
Avoided flood damage	Converting value of avoided harm from USD to NZD, correcting impact year	$5,125	$5,125	$8,277
Reduced stock loss in waterways		$1,575	$1,003	$1,003
Improved productivity for farmers due to reduced competition for grazing	Updating success rate	$170,615	$276,940	$242,323
Reduced costs to the agricultural sector and government associated with pest control	Updating impact value	$203,909	$251,435	$218,639
Avoided irrigation losses		$215,665	$232,980	$232,980
Avoided hydro losses		$268,451	$290,004	$290,004
Improved agricultural productivity	Updating impact value and success rate – a more conservative measure	$140,234	$156,818	$22,869
Reduced pasture damage from possums	Updating success rate	$1,218	$1,685	$1,474
Reduced youth unemployment	Updating the impact value used in CBAx	$168,818	$117,139	$125,599

Table 21: Q4 comparison – PV of environmental benefits ($000s)

Environmental benefit	2024 update	2023 Q4 results	2024 Q4 results	2024 Q4 results - updated
Increased carbon sequestration	Updating value used in CBAx and success rate	$36,177	$39,832	$42,189
Improved water quality	Correcting impact value year	$43,784	$43,784	$58,674
Improved biodiversity	Updating the impact value used in CBAx	$324,728	$324,728	$447,928
Improved water clarity	Updating the impact value used in CBAx	$43,784	$43,784	$39,116
Soil retention	Updating impact value	$5,212	$8,069	$7,312
Reduced water treatment costs	Correcting impact value year	$1,355,994	$2,402,558	$2,648,820
Reduced fire risks		$156,871	$169,466	$169,466
Avoided costs associated with managing biofouling	Correcting impact value year	$46,035	$54,776	$52,168

Table 22: Q4 comparison – PV of wellbeing and other benefits ($000s)

Wellbeing and other benefits	2024 update	2023 Q4 results	2024 Q4 results	2024 Q4 results - updated
Improved recreational value		$937	$937	$937
Aesthetic appeal	Updating average conversion rate used for pound sterling to NZD	$8,391	$9,516	$8,113
Reduced human health risks		$161,963	$49,965	$49,965
Improved cultural values		$184,429	$184,429	$184,429
Increase in fish catch		$76,995	$76,995	$76,995

The updates to the impact assumptions had the following effect on the overall results.

Table 23: Q4 comparison – Summary of incremental costs and benefits ($000s)

High-level summary	2023 Q4 results – original impact inputs	2024 Q4 results – original impact inputs	2024 Q4 results – updated assumptions
Costs (PV)	$1,473,688	$1,170,246	$1,170,133
Benefits (PV)	$3,620,910	$3,793,574	$3,943,424
Net present value at 5%	$2,147,222	$2,623,328	$2,773,291



Benefit Cost Ratio (BCR)	2.46	3.24	3.37
Payback period	7.004 years	5.268 years	5.279 years

Table 24: Q4 comparison – Incremental benefits ($000s)

Benefit summary	2023 Q4 results	2024 Q4 results	2024 Q4 results - updated
Project benefits (10-year NPV)	$2,230,970	$2,245,198	$2,221,752
Economic benefits (30-year NPV)	$1,175,611	$1,066,504	$914,535
Environmental benefits (30-year NPV)	$2,012,584	$2,469,597	$2,772,538
Wellbeing benefits (30-year NPV)	$432,715	$257,473	$256,351
Total incremental benefits (30-year NPV)	**$3,620,910**	**$3,793,574**	**$3,943,424**

Note: An 80% scaling was applied to 2024 Q4 results in order to be conservative about programme impacts. In comparison, 2023 Q4 results (for scenario 1) assumed 100% of benefits would be realised because costs were forecast to equal the programme budget.



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