

Some economic tools for assessing benefits and costs in biosecurity prioritisation: Pivotal assumptions and why you should care

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TE WHARE WĀNAKA O AORAKI



Benefit Cost Analysis

Discounting future benefits

Computational General Equilibrium Analysis

NZ relevant parameters

Multi-criteria Analysis

Which criteria matter

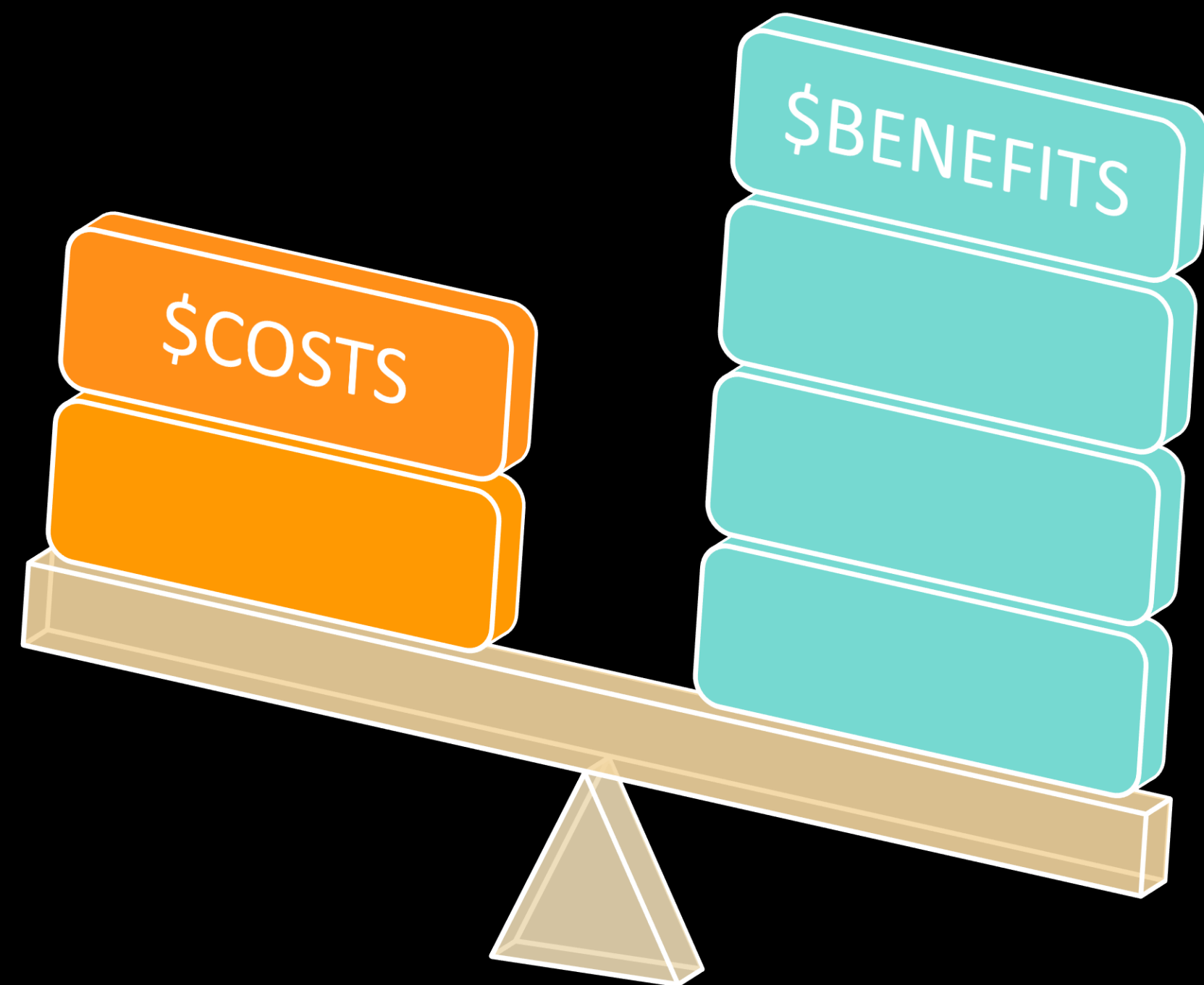
Benefit Cost Analysis

Based in Welfare Economics

Provides framework for comparing benefits and costs

Wilding Pines
Kiwifruit Vine Health

Standard method for assessing the relative desirability of competing alternatives



Ratio

$$\frac{\$BENEFIT}{\$COST} > 1$$

Net Benefit

$$\$BENEFIT - \$COST > 0$$

Benefits over
time

$$t_0 + t_1 + t_2 + \dots + t_T$$

Present Value

$$\frac{\$t}{(1+r)^t}$$

New Zealand

5%

Australia

7%

Canada

8%

USA

7%

UK

3.5%

Default rates typically reflect
the **Opportunity Cost of Capital**
proxied by **market rates of return**

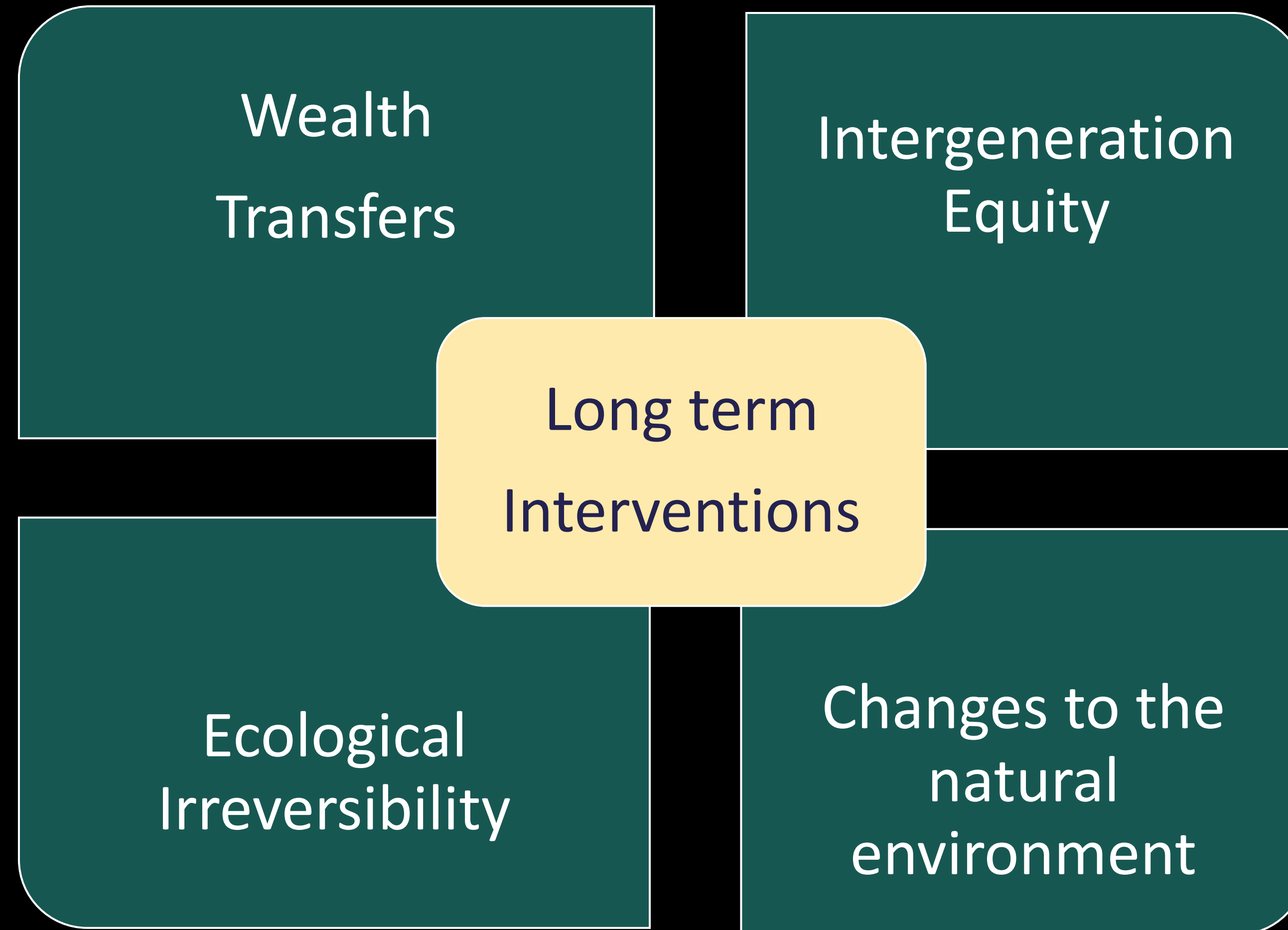
New Zealand	5%
Australia	7%
Canada	8%
USA	7%
UK	3.5%

3%

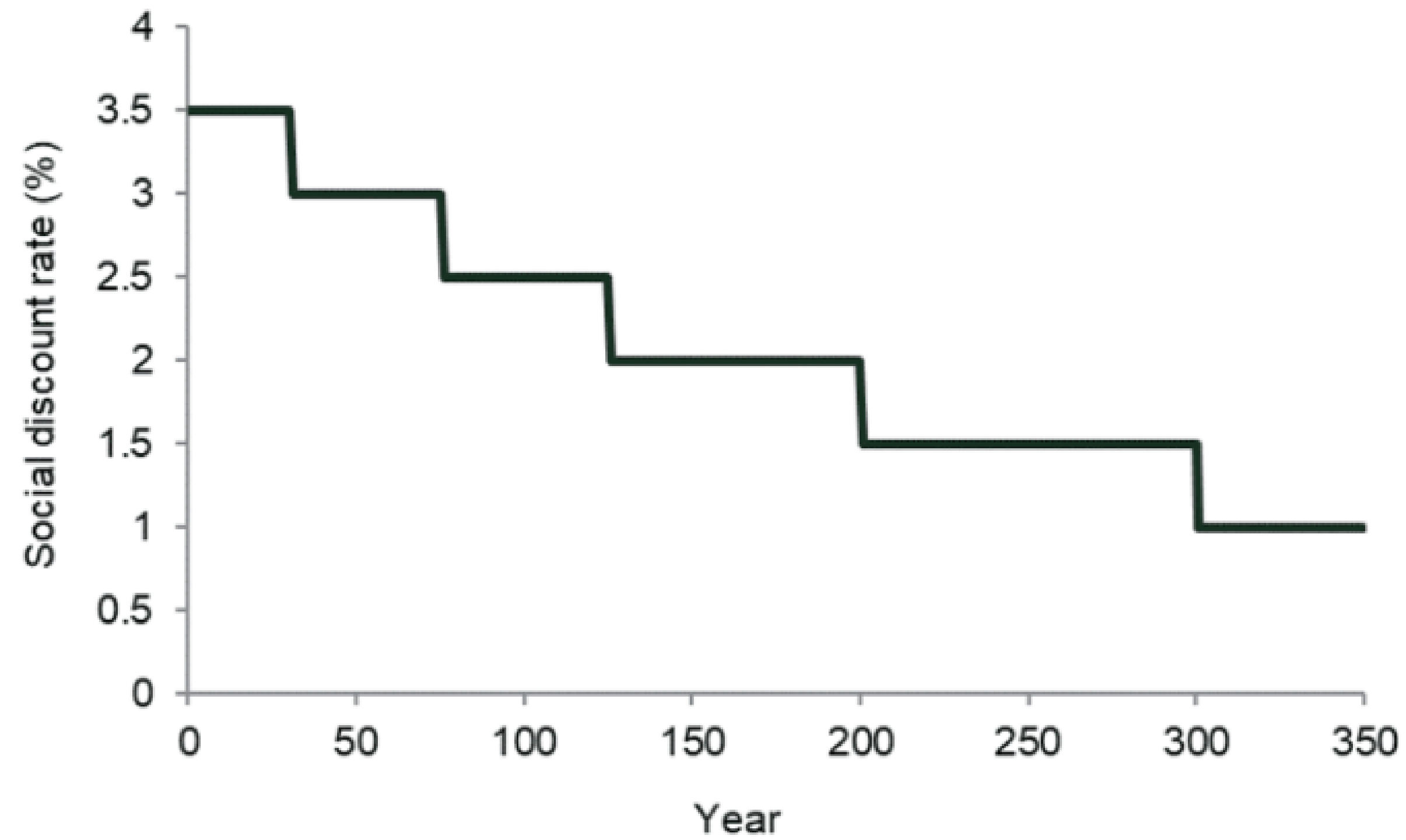
3%

3%

**Lower opportunity cost
of investment in
environmental assets reflect
Social Rate of Time Preference**

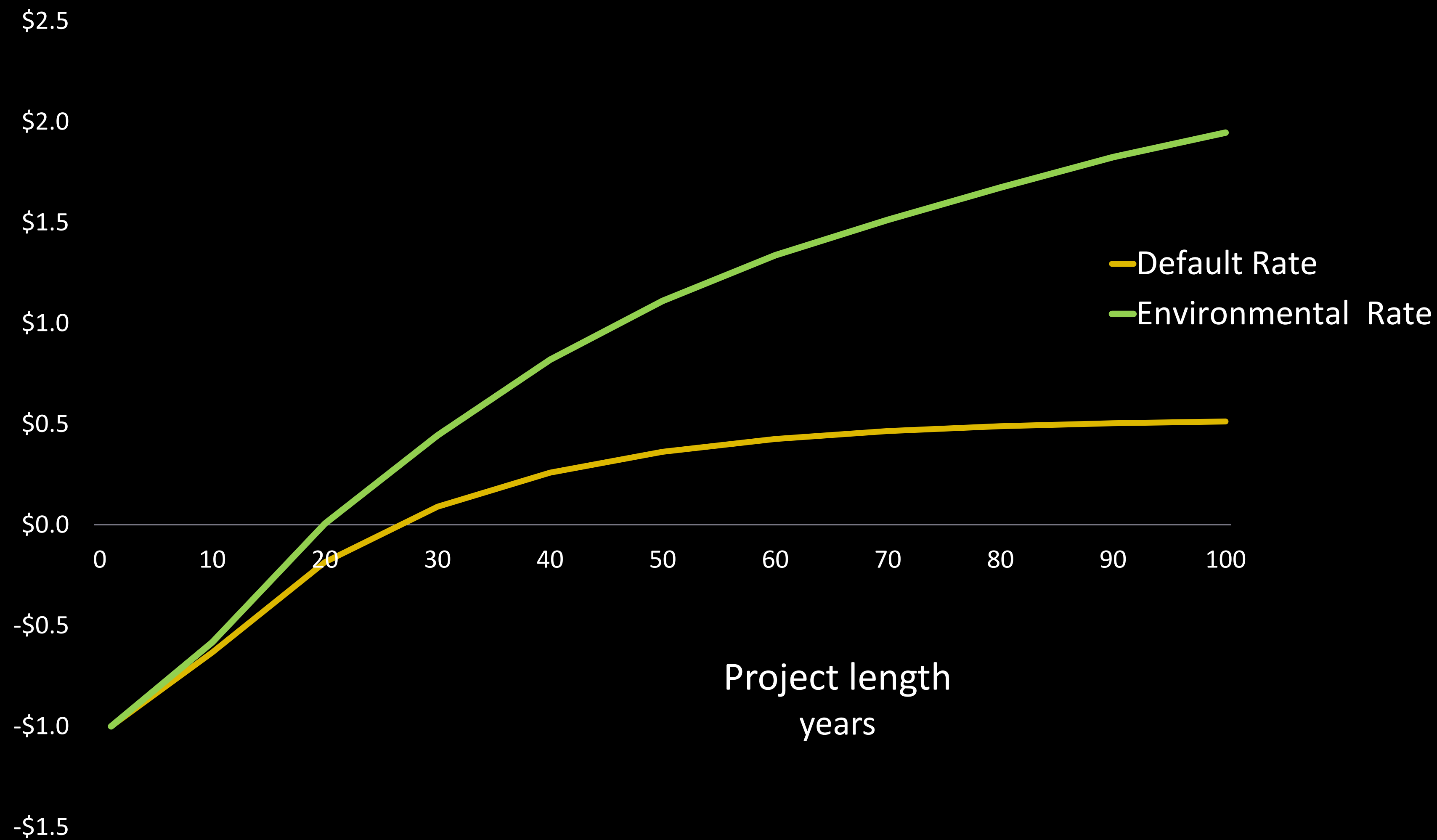


Term Structure of Discount Rates in the UK



Year	Costs	Benefits
0	\$1 million	None
1	\$10,000	None
2	\$10,000	None
3	\$10,000	None
4	\$10,000	None
5	\$10,000	\$100,000
6	\$10,000	\$100,000
7	\$10,000	\$100,000
8	\$10,000	\$100,000
9

Net Present Value
\$million



Discount Rate Research

- Why are we using the discount rates that we are?
- What rates are appropriate to the types of biosecurity response investments being made?
- Can we apply the Social Time Preference approach in New Zealand?



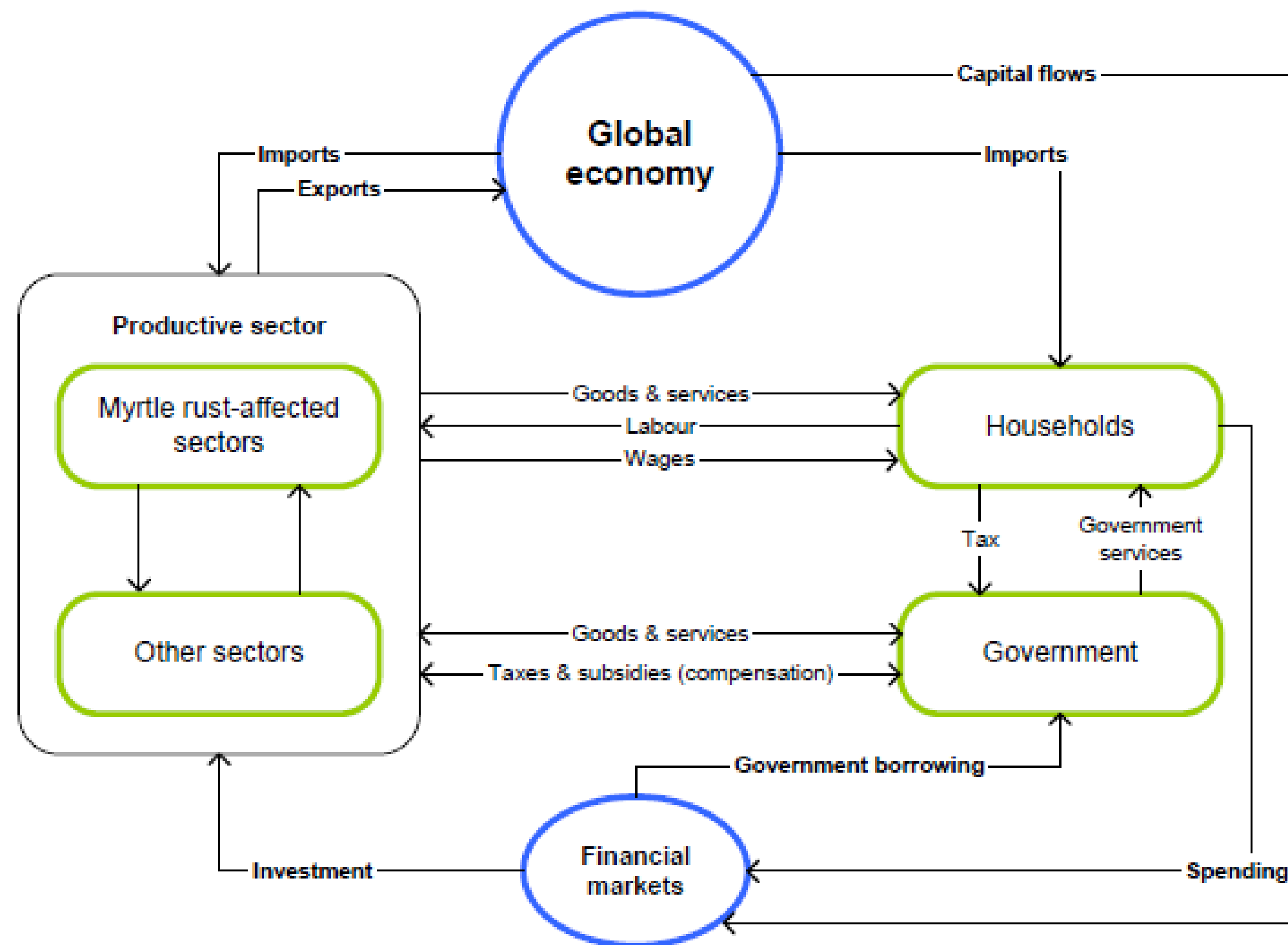
Computational General Equilibrium Analysis

Used for analysing economy wide impacts of shocks to commercial activities

Myrtle Rust: nursery sales, honey production

Foot & Mouth Disease: pastoral losses

Brown Marmorated Stink Bug: horticulture losses



Input-Output data
from Stats NZ
System of National
Accounts

Source: NZIER

Relationships matter

When something changes in one area of the model, how does this relate to other areas in the model?

Certain parameters can have significant influence on model outcomes

The CGE models being used currently are proprietary
and not peer-reviewable

But, MPI are building CGE capability that is focused on incursion
impacts context

Disaggregated to district level, and within sectors

CGE Project Ideas

Opportunity to connect with MPI CGE modelling

1. Explore connections between MPI model and others in NZ and internationally
 - Link to other models such trade/environment/energy
2. Enhance household representation
 - Disaggregate the representative household by e.g. demographics



Multi-criteria Analysis

One of the most flexible approaches.
Can accommodate various measures of benefits and costs

MPI Rapid Response Tool

Freshwater
Incursion Impacts

Independent Criteria

Productive landscapes

Ecological quality

Access to Recreation

Response activities cost

Independent Criteria

Productive landscapes

Ecological quality

Access to Recreation

Response activities cost

Units

Revenue \$

MCI score

Days per year

Costs \$

Independent Criteria

Units

Impact

Productive landscapes

Revenue \$

50,000

Ecological quality

MCI score

80

Access to Recreation

Days per year

130

Response activities cost

Costs \$

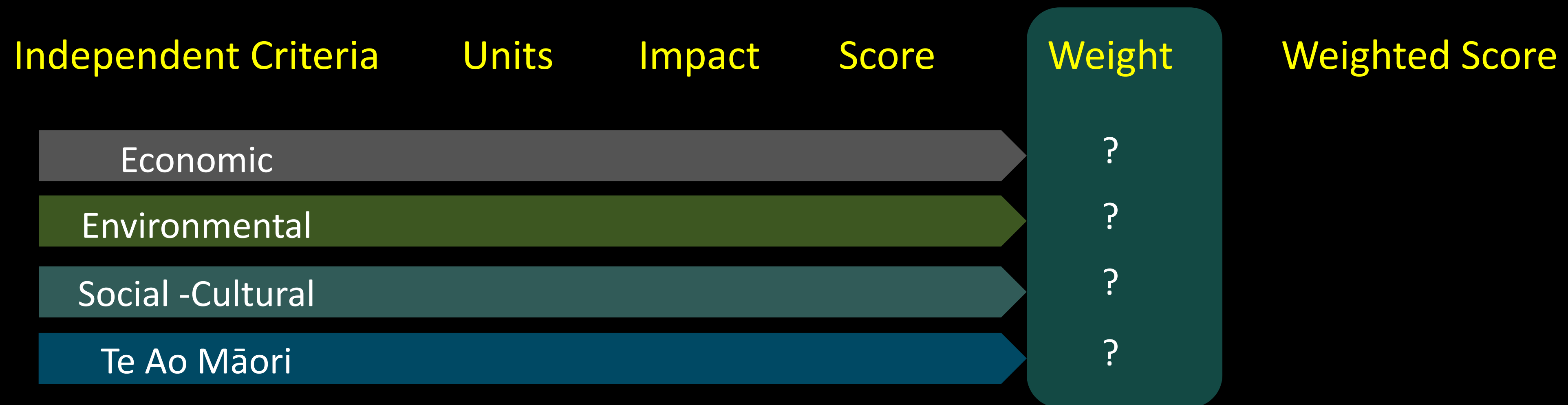
-90,000

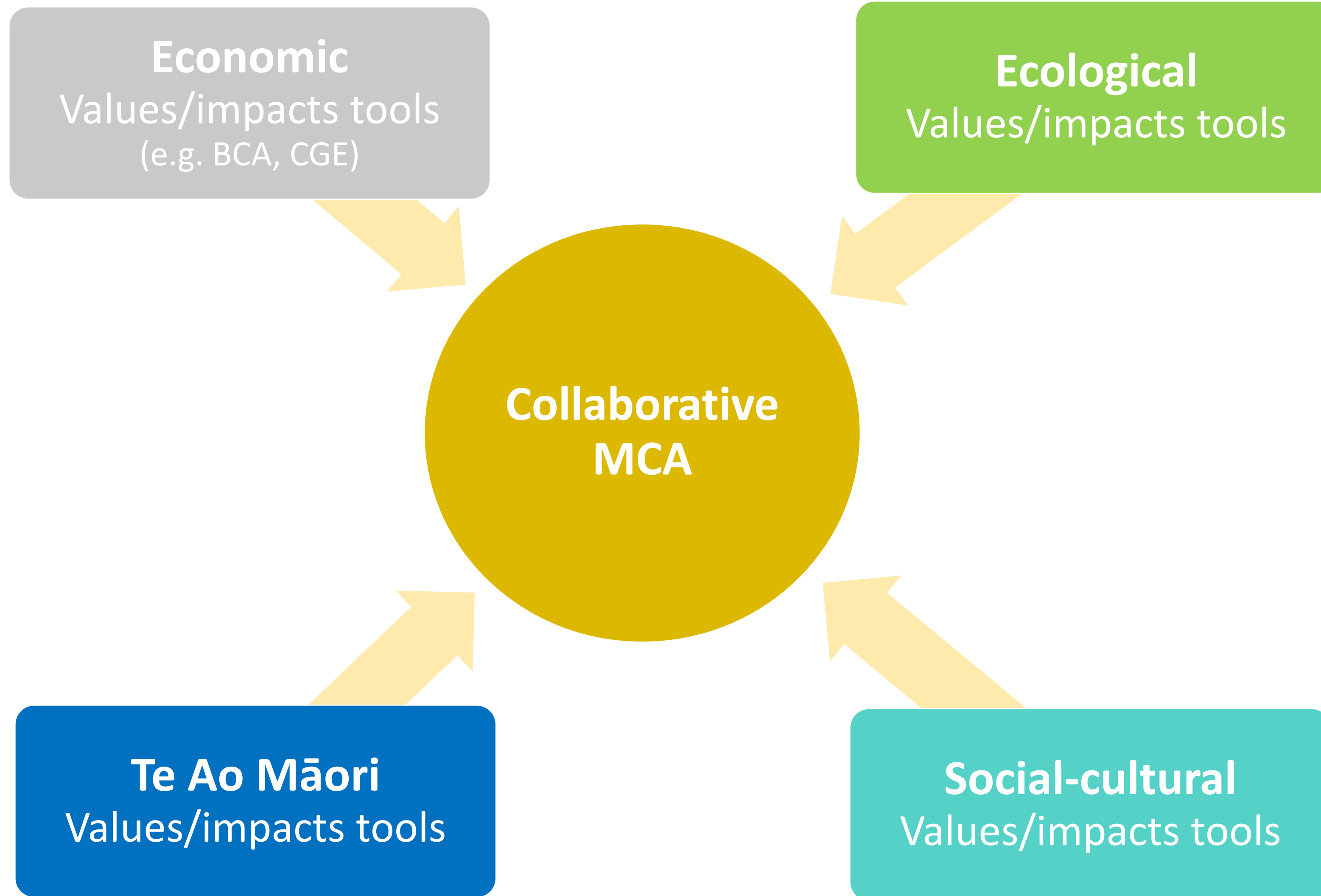
Independent Criteria	Units	Impact	Score (-4,+4)
Productive landscapes	Revenue \$	50,000	2
Ecological quality	MCI score	80	4
Access to Recreation	Days per year	130	3
Response activities cost	Costs \$	-90,000	-4

Independent Criteria	Units	Impact	Score (-4,+4)	Weight
Productive landscapes	Revenue \$	50,000	2	40
Ecological quality	MCI score	80	4	20
Access to Recreation	Days per year	130	3	10
Response activities cost	Costs \$	-90,000	-4	30

Independent Criteria	Units	Impact	Score (-4,+4)	Weight	Weighted Score
Productive landscapes	Revenue \$	50,000	2	40	80
Ecological quality	MCI score	80	4	20	80
Access to Recreation	Days per year	130	3	10	30
Response activities cost	Costs \$	-90,000	-4	30	-120

70





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