



Monetised Benefits and Costs Manual (MBCM)

26 April 2023

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Te Kāwanatanga o Aotearoa
New Zealand Government



Ian Melsom

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Purpose of this workshop

- To present the recent updates to the MBCM that were released in Version 1.6 on 14 April 2023
- To explain the impacts of these updates
- To provide a forum for questions and answers concerning the updates



Key updates

1. Injury costs
2. Travel time values, congestion and trip reliability values
3. Costs of harmful emissions
4. Cost of carbon
5. Walking and cycling health benefits
6. Walking and cycling demand estimates and analysis procedures
7. Simplified procedures
8. Adaptive decision making
9. Clarification of Government BCR (BCR_G)
10. Update factors for 2022 base year
11. Content clarifications, improvements, updates
12. Q&A

Injury costs

Values from 2021 research - mean values of preventing fatalities and injuries

	Willingness to pay per event (\$/respondent)	Minimum aggregate national value	Maximum aggregate national value
Death	\$4.3	\$8.1 million	\$16.9 million
Serious injury	\$0.225	\$429,458	\$890,681
Minor injury	\$0.023	\$44,218	\$91,707

Waka Kotahi adopted values at mid-point of 2021 research ranges

Injury severity	Fatal	Serious	Minor
New research mid-point values (\$2021)	\$12,500,000	\$660,100	\$68,000

Injury costs

Cost per crash by vehicle involvement in 100km/h speed limits (for All Movements)

100km/h speed limit, all movements	Total cost per crash by vehicle type (\$ July 2021)					
	Cycle	Motor-cycle	Bus	Truck	Car, van, other	All vehicles
New injury costs (MBCM Version 1.6)						
Fatal injury	12,700,000	13,500,000	18,100,000	14,600,000	15,200,000	14,900,000
Serious injury	746,000	730,000	987,000	810,000	882,000	842,000
Minor injury	72,000	72,000	94,000	80,000	89,000	86,000
Old injury costs (MBCM Version 1.5)						
Fatal injury	4,510,000	4,840,000	6,490,000	5,230,000	5,450,000	5,340,000
Serious injury	511,500	500,500	676,500	555,500	605,000	577,500
Minor injury	27,500	27,500	36,300	30,800	34,100	33,000

Travel time values

Two sets of travel time values:

- **Behavioural values** – for demand modelling
- **Equalised values** – for economic assessments



Travel time values for demand modelling

Behavioural values: for vehicle and PT occupants, pedestrians, cyclists for all road categories; all time periods (\$/h/person July 2021)

Vehicle occupants, walking and cycling	Work travel purpose	Commuting to/from work	Other non-work travel purposes
Behavioural values of time for uncongested traffic (\$/h/person)			
Drivers and passengers in Cars, LCVs, MCVs, HCVs, Motorcycles	37.92	30.90	31.21
Seated bus and train passenger		8.16	6.61
Standing bus and train passenger		11.88	10.33
Pedestrian and cyclist		11.88	10.33

Maximum increment for congestion (\$/h/person)			
Drivers and passengers in Cars, LCVs, MCVs, HCVs, Motorcycles	26.34	26.34	24.47
PT seating		6.96	5.18
PT standing		10.13	8.10

Travel time values for economic assessment

Equalised values of travel time for all road categories; all time periods; all users
\$/hr/person July 2021

	New values in MBCM Version 1.6 (\$/h/person, 2021)			Old values in MBCM Version 1.5 (\$/h/person, 2021)		
	Work travel	Commuting to/from work	Non-work travel	Work travel	Commuting to/from work	Non-work travel
Uncongested traffic	\$37.92	\$19.53	\$18.91	\$37.92	\$12.40	\$10.97
Maximum increments for congestion	\$26.34	\$16.65	\$14.83	\$5.00	\$5.00	\$4.37

Travel time values for economic assessments

New composite travel time values for different road categories – based on default traffic mixes

Sample composite travel time values and max increments for congestion (\$July 2021)

Road category all time periods	Composite value of time (\$/h/vehicle)	Maximum increments for congestion (CRV \$/h/vehicle)
Urban arterial	38.24	26.17
Urban other	38.36	26.38
Rural strategic	49.43	32.24
Rural other	48.61	32.13

Higher travel time values

Impacts

- Cost of congestion
- Value of trip reliability

higher values
of travel time

=

higher costs of congestion
and higher value of trip
reliability



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Costs of harmful emissions

	New values in MBCM Version 1.6 (\$/tonne, 2022)			Previous values in MBCM Version 1.5 (\$/tonne, 2016)
	Urban	Rural	National	National
PM_{2.5}	\$853,824	\$49,075	\$530,676	N/A
PM₁₀	N/A			\$460,012
NO_x	\$865,797	\$24,040	\$325,312	\$16,347
CO	\$4.87	\$0.19	\$2.99	\$4.13
VOC/HC	\$1,545	\$61	\$949	\$1,310
SO₂	\$38,334	\$1,546	\$24,160	N/A

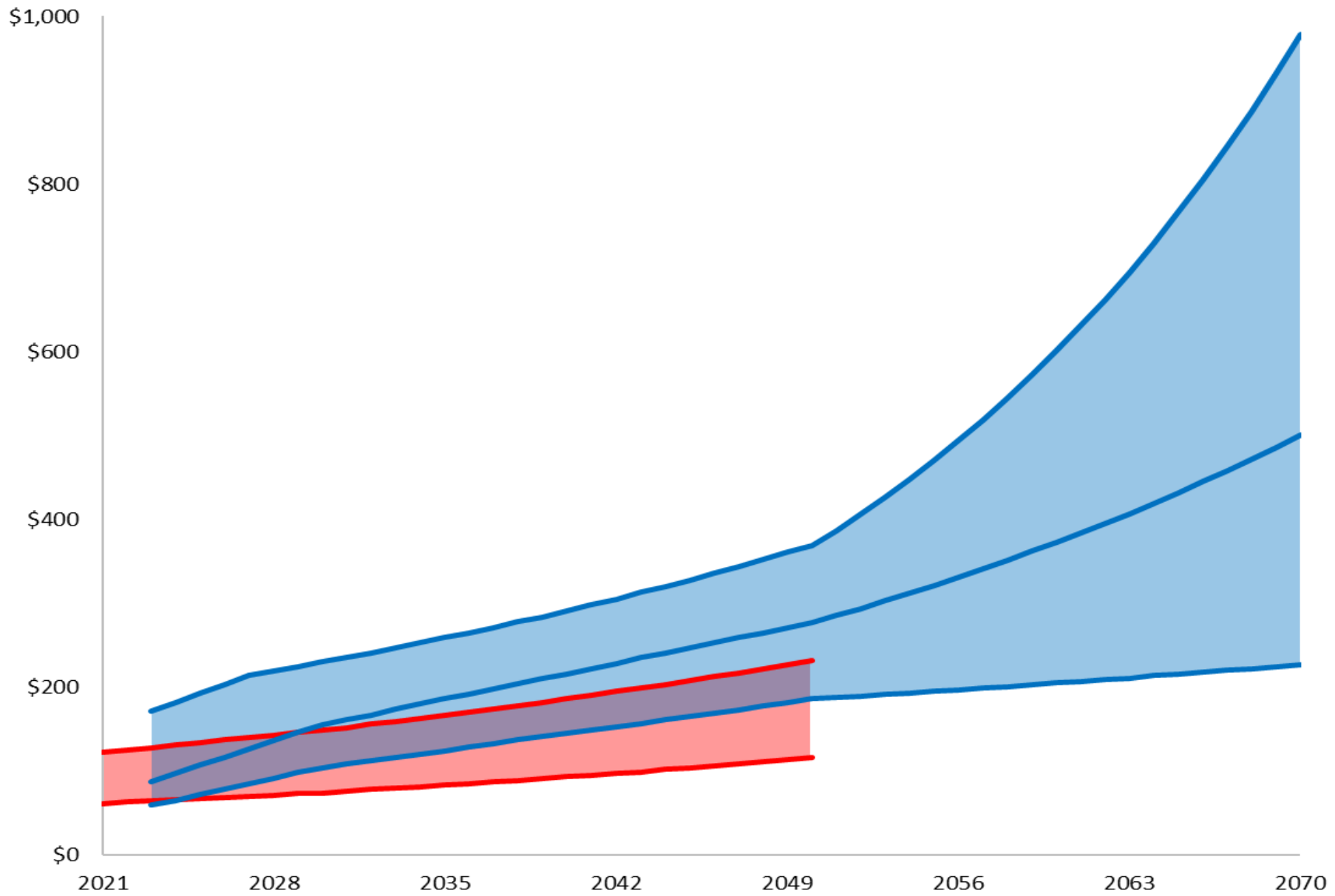
Cost of carbon

Shadow price of carbon
(NZ\$2022 per tonne of CO2
equivalent) – for use across
Govt Sector

Use middle price path for
economic evaluation and
low and high price paths for
sensitivity tests

Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Low	\$59	\$65	\$72	\$78	\$85	\$91	\$98	\$104	\$108	\$112	\$116	\$120
Middle	\$87	\$97	\$107	\$116	\$126	\$136	\$146	\$155	\$161	\$167	\$174	\$180
High	\$171	\$182	\$193	\$203	\$214	\$219	\$224	\$230	\$235	\$241	\$247	\$253
Year	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Low	\$124	\$129	\$133	\$137	\$141	\$145	\$149	\$153	\$157	\$161	\$165	\$169
Middle	\$186	\$192	\$198	\$204	\$210	\$216	\$222	\$228	\$235	\$241	\$247	\$253
High	\$259	\$265	\$271	\$278	\$284	\$291	\$298	\$305	\$313	\$320	\$328	\$336
Year	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
Low	\$173	\$178	\$182	\$186	\$188	\$189	\$191	\$193	\$195	\$197	\$199	\$201
Middle	\$259	\$265	\$271	\$277	\$286	\$294	\$303	\$312	\$321	\$331	\$341	\$351
High	\$344	\$352	\$361	\$369	\$387	\$407	\$427	\$448	\$471	\$494	\$519	\$545
Year	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Low	\$203	\$205	\$207	\$209	\$211	\$214	\$216	\$218	\$220	\$222	\$224	\$227
Middle	\$362	\$373	\$384	\$395	\$407	\$419	\$432	\$445	\$458	\$472	\$486	\$501
High	\$572	\$601	\$631	\$662	\$695	\$730	\$767	\$805	\$845	\$887	\$932	\$978

New shadow price path vs Previous shadow price path

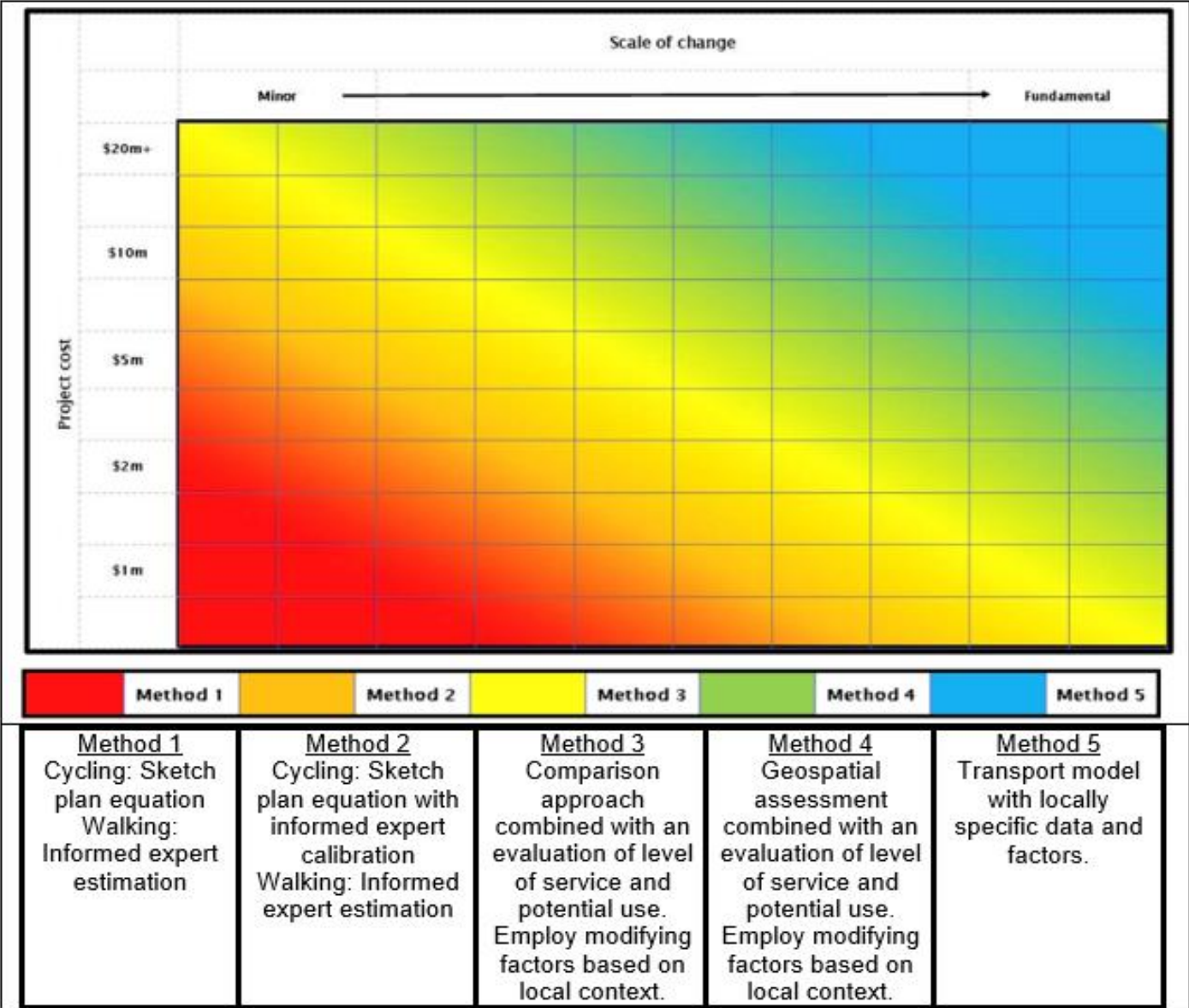


Rafael Furtado
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Walking and cycling procedures

Walking and cycling demand methods and selection matrix



Cycling procedures

Cycle demand – from SP11

Parameters for cycling demand estimation:

- Jobs within buffers
- Quality of Service score from AT QoS method
- Directness (optional)



Health benefits of walking and cycling

	New values (\$2021)		Previous values (\$2021)	
Benefits	\$/km	Max. annual benefit per new user (cap)	\$/km	Max. annual benefit per new user (cap)
Pedestrians	\$9.90	\$3,100	\$4.66	\$1,325
Cycling - conventional	\$4.90	\$6,200	\$2.33	\$2,650
Cycling - Ebikes	\$2.50	\$4,600	\$1.06	\$2,120

Simplified procedures SP1 to SP 13

All simplified procedures updated –
key updates:

- New parameter values
- New procedures for walking and cycling
- Appraisal summary table added to each SP



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Adaptive decision making

Can be used in situations where there is deep uncertainty

- Involves considering all possible outcomes
- Provides additional analysis options and methods
- Relies on plans designed to be adaptive over time



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Government BCR, BCR_G

- Context
- Definition

$$BCR_G = (B - C_p) / (C - C_p) = (B - C_p) / C_g$$

B: PV of national economic benefits

C_p: costs borne by parties outside NLTF system

C: PV of national economic costs

C_p: costs borne by parties outside NLTF system

- Economic theory
- Possible pinch points



Update factors – on website not in MBCM

- What is update factor
- How to use it
- Parameter value
- In doubt, contact Investment Assurance team or your local Waka Kotahi Investment Advisors

The factors for updating the benefit values in this manual are:		
Benefit parameter	Base Date	Factor to update to July 2022
Travel time cost savings ^{TT}	July 2021	1.03
Vehicle operating cost savings ^{VOC}	July 2015	1.43
Crash cost savings ^{ACC}	July 2021	1.06
Comfort benefits ^{CB}	July 2021	1.03
Driver frustration ^{DF}	July 2021	1.03
Passenger transport user benefits ^{PT}	July 2021	1.03
Walking and cycling benefits ^{WCB}	July 2021	1.03
Travel behaviour change benefits ^{TBhC}	July 2008	1.32
Emission reduction benefits	July 2021	1.06

The factors for updating construction and maintenance cost estimates prepared in earlier years are:	
Calendar year in which cost estimate was prepared	Factor to update to July 2022
2013	1.32
2014	1.30
2015	1.29
2016	1.29
2017	1.25
2018	1.24
2019	1.20
2020	1.18
2021	1.13

**Pātai
Questions?**