Mode shift to micromobility

Infographics: practitioners guidance

M Ensor, Beca
O Maxwell, Beca
O Bruce, Micromobility Industries

February 2021 – Waka Kotahi NZ Transport Agency Sector Research Programme

A note to the audience

This presentation is based on research report RR 674 – *Mode shift to micromobility*

While Waka Kotahi NZ Transport Agency provided investment, the research was undertaken independently, and the resulting findings should not be regarded as being the opinion, responsibility or policy of Waka Kotahi or indeed of any NZ Government agency.

Waka Kotahi is established under the Land Transport Management Act 2003. The objective of Waka Kotahi is to undertake its functions in a way that contributes to an efficient, effective and safe land transport system in the public interest. Waka Kotahi funds innovative and relevant research that contributes to this objective.

People using this research should apply and rely on their own skill and judgement and, if necessary, they should seek appropriate legal or other expertise regarding its use.

Micromobility modes

E-scooter

Powered transport device

< 300 W power

(Waka Kotahi determination)

E-bike

< 300 W power

E-accessible

Powered mobility devices

< 1500 W

E-mopeds

Powered Transport Device

300 W - 600 W power

(Waka Kotahi determination)

The mode shift research results

1. Mode shift to micromobility
2. Mode shift to public transport

Mode shift range

Overall, micromobility mode share is expected to be **between 3% and 11% by 2030** depending on a range of context factors

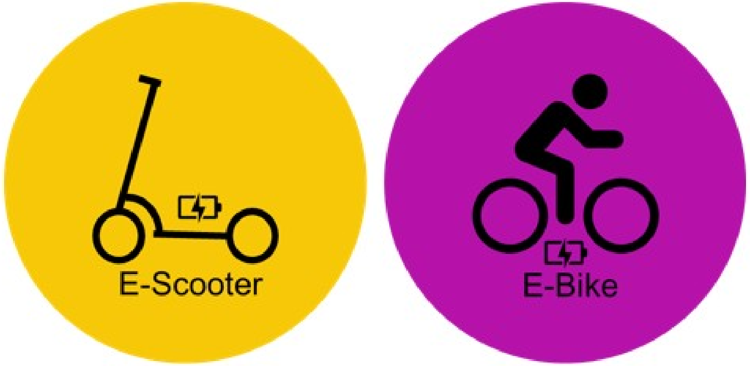
This represents a **four-fold or more increase on existing cycle mode share**, which has significant implications for active modes funding

Up to **5.7%** mode share

Up to **8.1%** mode share

Table 5.7 Micromobility mode shift – percentage of trips (by initial mode) shifted to each micromobility mode

Initial mode	Micromobility mode	Mode shift
Walk	E-scooter	3%-15%
	E-bike	3%-16%
	E-moped	2%-9%
	E-accessible	<0.2%
Cycle	E-scooter	<0.1%
	E-bike	34%-46%
	E-moped	<0.1%
	E-accessible	<0.1%
Car	E-scooter	0.2%-1.2%
	E-bike	1.3%-6.1%
	E-moped	0.5%-2.1%
	E-accessible	<0.1%
Public Transport	E-scooter	1%-3%
	E-bike	3%-10%
	E-moped	2%-5%
	E-accessible	<0.3%



The table details which mode the micromobility trips would mode shift from by the percentage of that mode that will mode shift. It is a range, and practitioners need to make judgement on where in the range they choose

The figure (%) for mode shift from cycle mode to e-bike is high due to the relatively smaller number of cyclists than other modes

Mode shift to micromobility

Land-use	Modelled scenarios	Mode share range
Major city - CBD	• High uptake scenario for e-scooters • Medium uptake scenario for e-bikes	• E-scooter mode share: 1.6%-5.7% of all trips • E-bike mode share: 4.9%-5.1% of all trips
Major city – fringe (~5 km radius)	• Medium uptake scenario for e-scooters • High uptake scenario for e-bikes	• E-scooter mode share: 1.0%-3.4% of all trips • E-bike mode share: 7.7%-8.1% of all trips
Major city - suburban	• Medium uptake scenario for e-scooters • Medium uptake scenario for e-bikes	• E-scooter mode share: 1.0%-3.4% of all trips • E-bike mode share: 4.9%-5.1% of all trips
Regional city – CBD/fringe	• Medium uptake scenario for e-scooters • Medium uptake scenario for e-bikes	• E-scooter mode share: 1.0%-3.4% of all trips • E-bike mode share: 4.9%-5.1% of all trips
Regional city - suburban	• Low uptake scenario for e-scooters • Low uptake scenario for e-bikes	• E-scooter mode share: 0.3%-1.2% of all trips • E-bike mode share: 1.8%-2.0% of all trips

Mode shift to micromobility: whole trips

Up to a **9%** **increase** in PT trips

Overall, ‘first mile last mile’ use of micromobility in conjunction with public transport is expected to **increase public transport trips by up to 9%**, depending on a range of context factors, and **decrease car trips by up to 2%.**

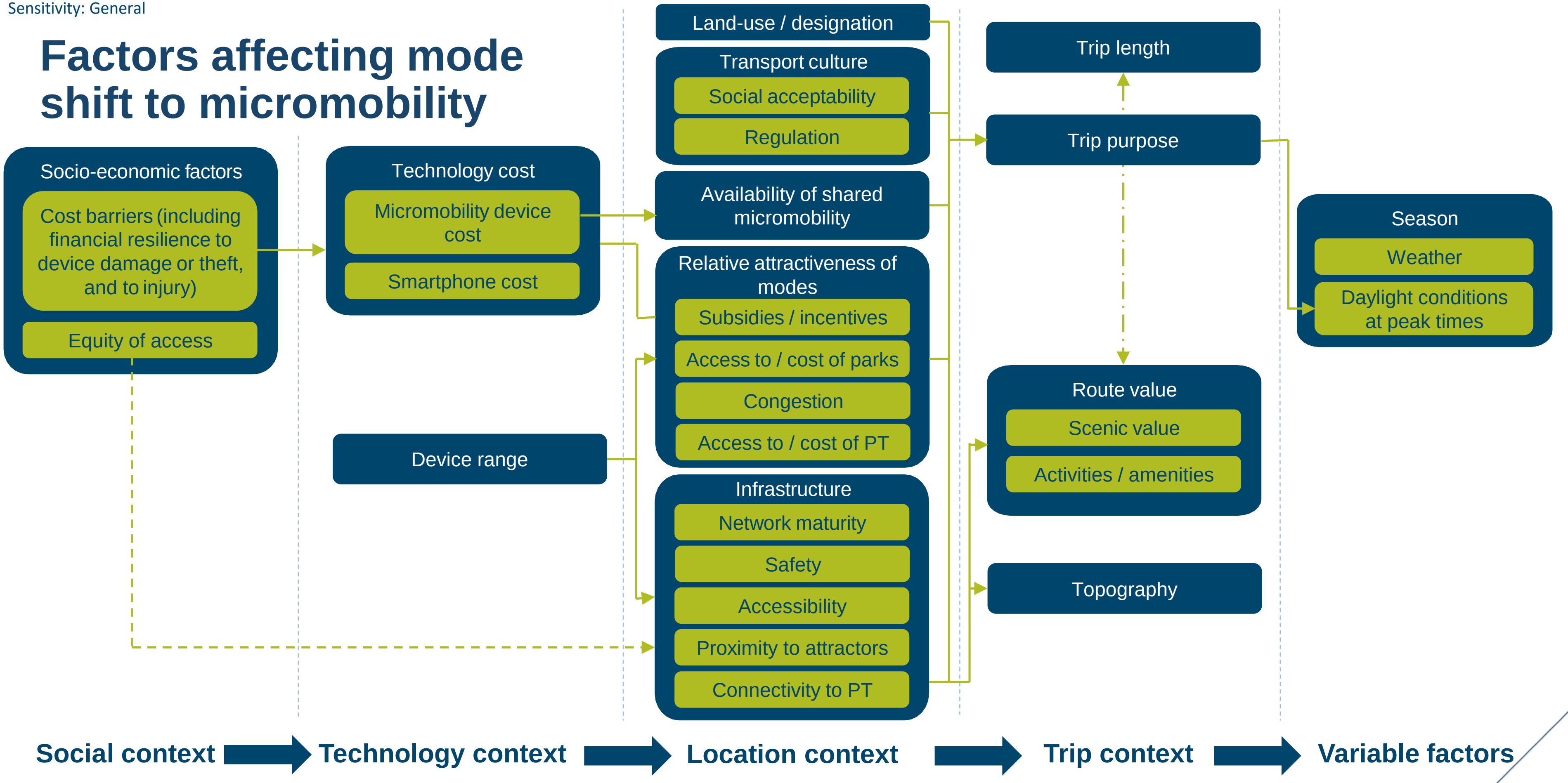
Mode shift to public transport

Scenario	Context	Effect
Central business district (CBD)/fringe (~5 km radius)	• High levels of public transport • High availability of micromobility	• 2% decrease in car trips • 6% increase in public transport patronage
CBD/fringe (~5 km radius)	• High levels of public transport • Low availability of micromobility	• 1.5% decrease in car trips • 3% increase in public transport patronage
Suburban	• High levels of public transport • High availability of micromobility	• 1% decrease in car trips • 9% increase in public transport patronage
Suburban	• High levels of public transport • Low availability of micromobility	• 0.5% decrease in car trips • 6% increase in public transport patronage
Suburban	• Low levels of public transport	• 0.5% decrease in car trips • 7% increase in public transport patronage

How to forecast micromobility mode shift and first / last mile impact for public transport

1. Mode shift to micromobility

Factors affecting mode shift to micromobility



How to forecast micromobility mode share

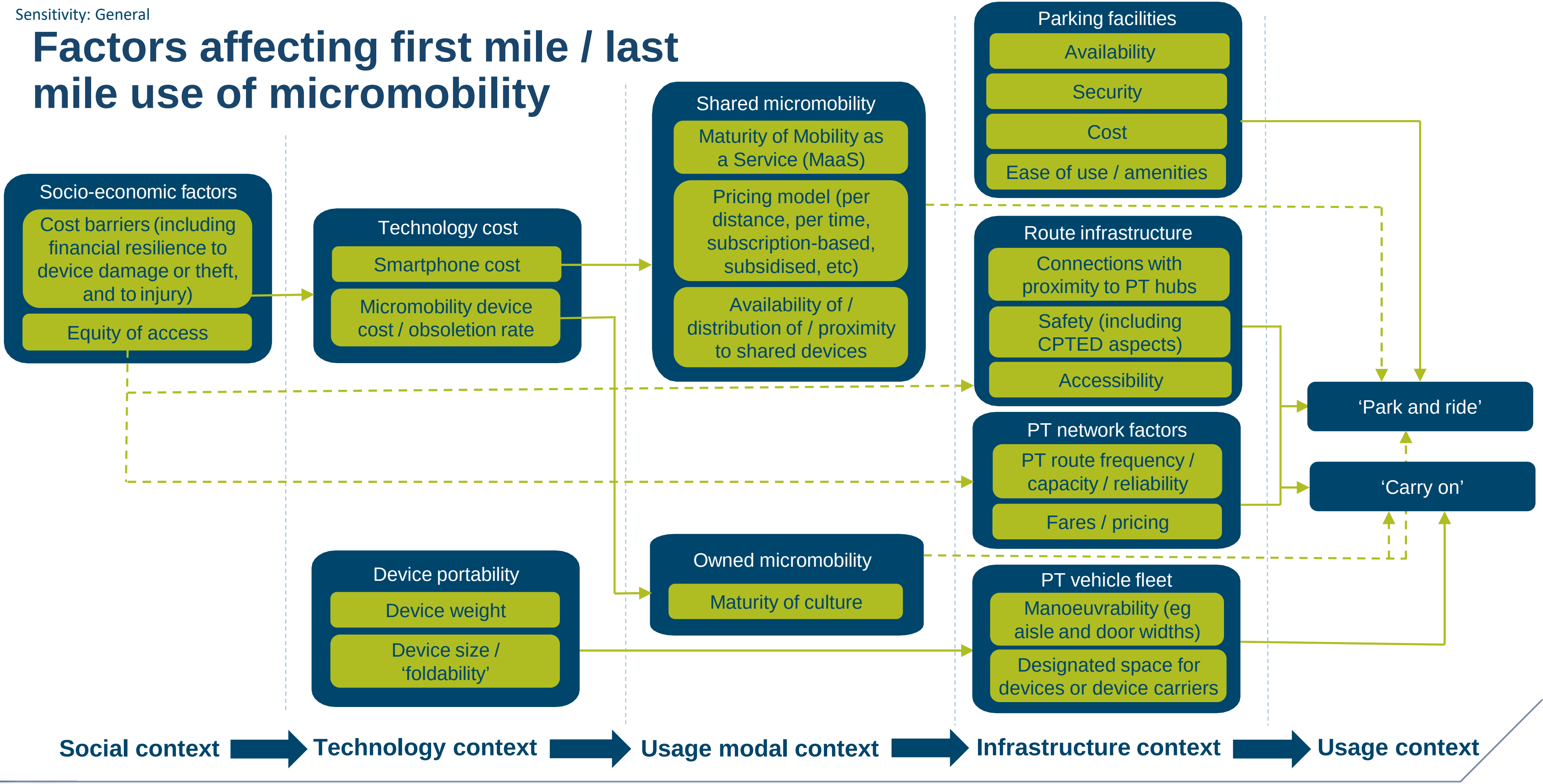
Land use & uptake	Mode shift range	Adjustment from factors
Select the land use & uptake	Look up the correct mode shift range	Assess six factors to select mode shift from within forecast range

- Proximity of routes to ‘attractive’ destinations
- Quality and safety of route infrastructure
- Attractiveness of mode alternatives
- Maturity of network / transport culture
- Amenity and aesthetic value of routes
- Socio-economic factors

2. Mode shift to public transport

Sensitivity: General

Factors affecting first mile / last mile use of micromobility



How to forecast increase in public transport patronage and associated reduction in car mode share

Land use & context	Mode shift forecast	Adjustment from factors
Select the land use & context	Look up the patronage increase and mode shift	Assess six factors to adjust the forecasts

- Presence / maturity of Mobility as a Service (MaaS)
- Quality of public transport provided
- Availability of shared micromobility
- Provision for micromobility parking at connection points
- Ability to take devices onboard public transport services
- Maturity of micromobility culture in the location of interest

How to forecast carbon emissions reduction from micromobility

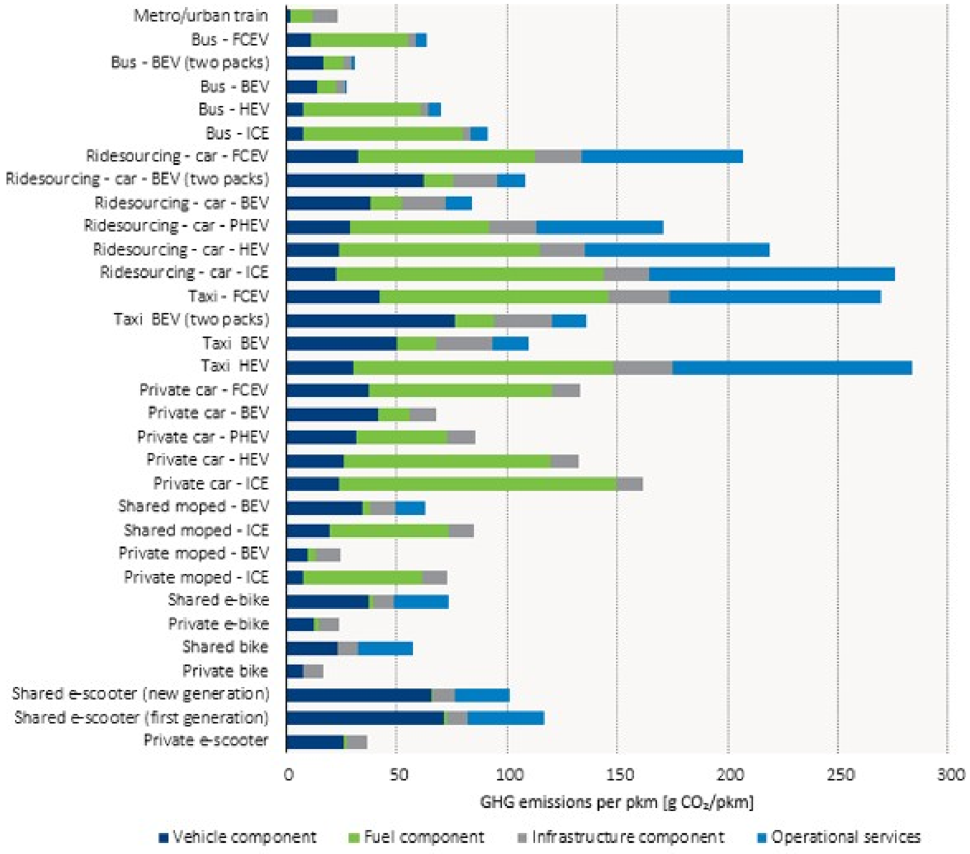


Figure 3 – Carbon Emissions per passenger km by transport mode (using NZ electricity generation)

Carbon emissions by transport mode

The ITF assumption of 563 g CO2e /kWh has been replaced by 110 g CO2e /kWh, reflecting New Zealand's relatively 'green' electricity
Reference: MBIE (2020)

References: ITF (2020) Good to go? Assessing the Environmental Performance of New Mobility, and Ensor, M (2021)

How to forecast carbon reductions

Forecast mode shift → **Select reduction in g CO_2e / p km** → **Apply reduction in p veh - km**

Select the reduction in car veh – km from within range in tables

Micromobility mode	Reduction in % of car veh-km
E-scooters	0.02% - 0.94%
E-bikes	0.65% - 3.69%

Public transport	Reduction in % of car veh-km
CBD	1.5% - 2.0%
Suburban	0.5% - 1.0%

CO_2e / p km (car) – CO_2e / p km (mode shift)

Device / vehicle	Total for mode (g CO_2e / p km)
E-scooter	34
E-bike	20
Car – ICE	150
Bus – ICE	88
Metro/urban train	12

Table 4 Carbon intensity of transport modes per passengers km

Based on New Zealand electricity generation in 2018, and assumed mix of personal and shared vehicles.
Reference: Ensor, M (2021)

Multiply reduction in CO_2e / p km by the veh – km (car) reduced

Typical reductions in emissions will be between 0.5% and 2.5% of total urban car trip emissions

References

- Ensor, M. (2021, May). *Decarbonisation Impact of Micromobility.* Transportation Group Conference 2021, Auckland, New Zealand. https://az659834.vo.msecnd.net/eventsairaueprod/production-harding-public/b6ac73e7090444589fdba5d082fafd50
- Ensor, M., Maxwell, O., & Bruce, O. (2021). *Mode shift to micromobility* (Waka Kotahi NZ Transport Agency research report 674). https://nzta.govt.nz/resources/research/reports/674
- International Transport Federation (ITF). (2020). *Good to Go? Assessing the Environmental Performance of New Mobility* (Corporate Partnership Board Report) published 17 September 2020, viewed March 2021. https://www.itf-oecd.org/good-go-assessing-environmental-performance-new-mobility
- Ministry of Business Innovation and Employment (MBIE). (2020). *New Zealand energy sector greenhouse gas emissions.* Viewed March 2021. https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/new-zealand-energy-sector-greenhouse-gas-emissions/

For further information:

Research report author:

matthew.ensor@beca.com

https://www.beca.com/

Full research report:

https://www.nzta.govt.nz/resources/research/reports/674/

Waka Kotahi NZ Transport Agency Sector Research Programme:

NZTAResearch@nzta.govt.nz

https://www.nzta.govt.nz/planning-and-investment/learning-and-resources/research-programme/

WAKA KOTAHI NZ TRANSPORT AGENCY

Beca

New Zealand Government