4-Year Trends of Personal Mobility Devices in Metropolitan Vancouver:

Evolution of Mode Shares, Speeds, and Comfort in Off-Street Paths

Prepared for TransLink

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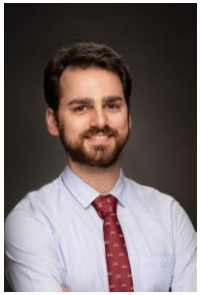
MEET THE TEAM



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UBC

research on active transportation

react


HUB Cycling Bike The Night, 2024

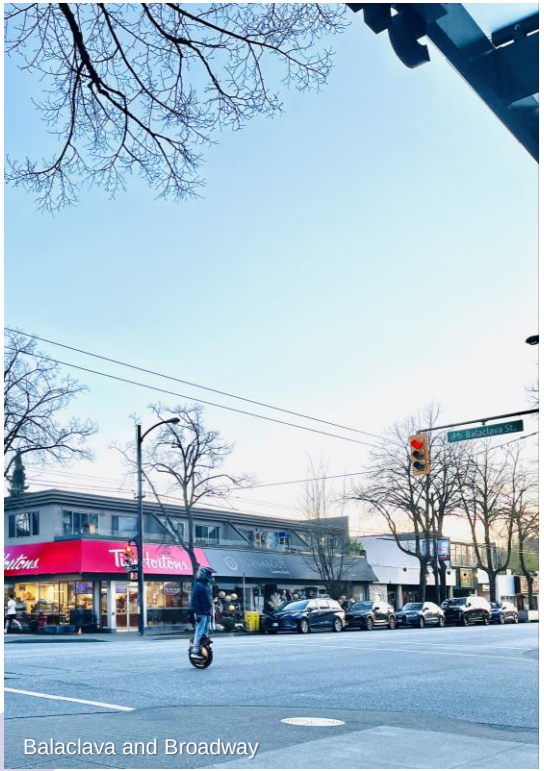
INTRODUCTION

MOTIVATION

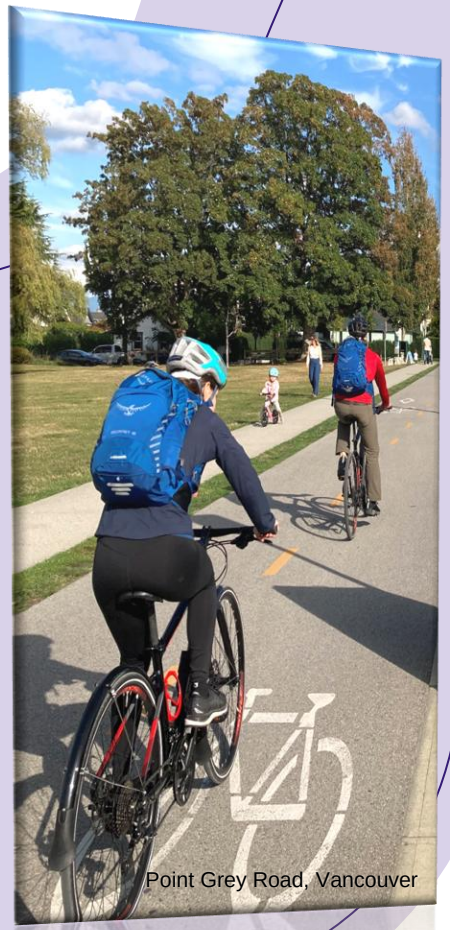
- Rapid apparent growth of Personal Mobility Devices (PMD) e-bicycles, -scooters, -skateboards, and -unicycles.
- Understanding the evolving usage of PMDs and their impacts on other path users to informing transportation design and policy.
- Capturing benefits of PMD while ensuring safety and comfort for all travellers.

Apollo Scooters Canada

OBJECTIVES


Balaclava and Broadway

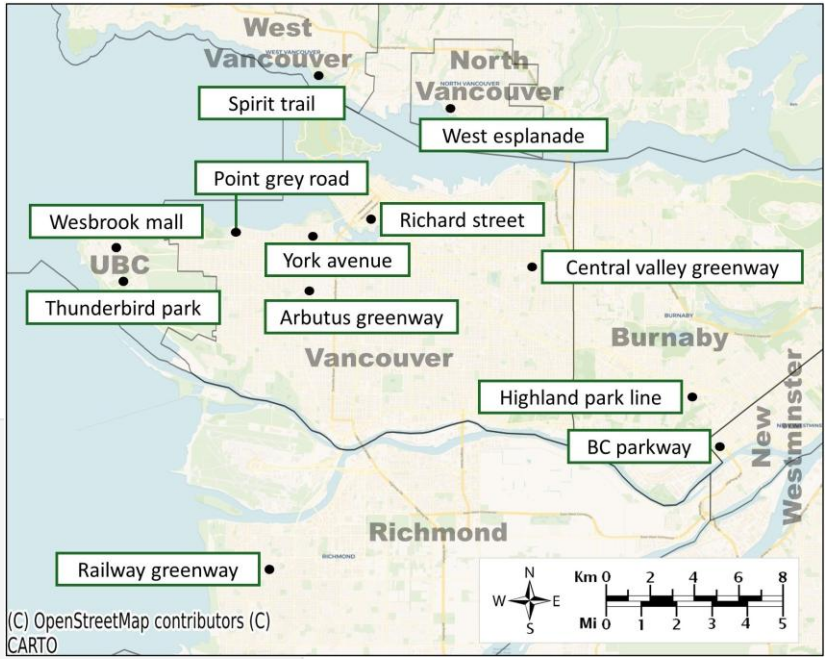
- Investigate longitudinal changes in the mode shares and speeds of personal mobility devices in metropolitan Vancouver
- Determine the implications of those changes for the comfort of travellers in off-street facilities.



Point Grey Road, Vancouver

DATA

SAMPLING LOCATIONS



Dataset 2
Path users' comfort sharing path with personal mobility devices and with pedestrians at the same 12 sampling locations

2019-2020 — 2020 · · · 2023

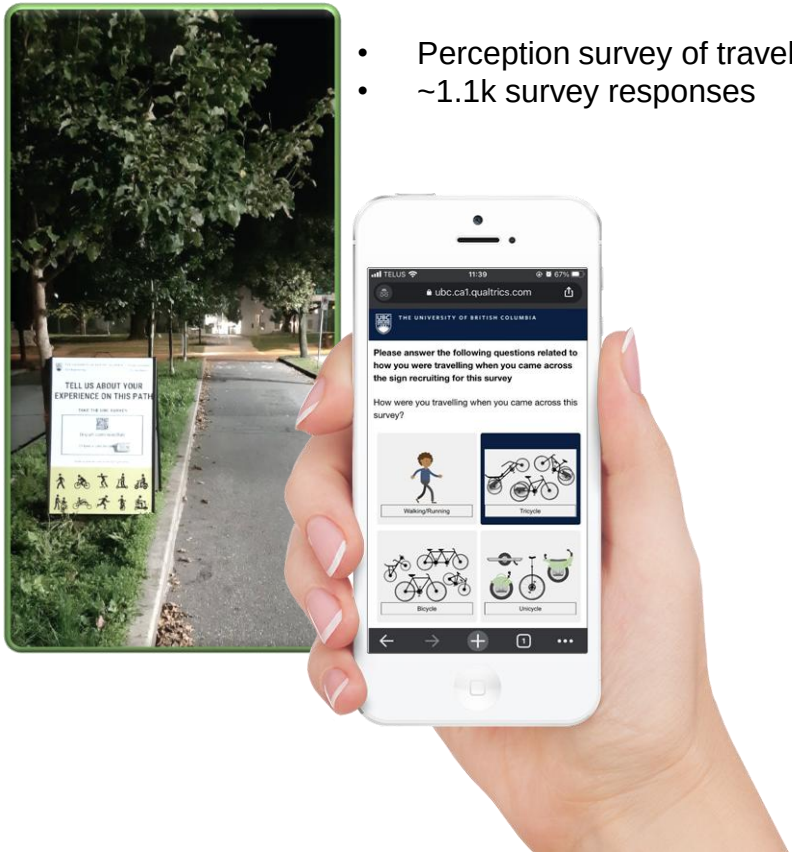
Dataset 1
Classified count and cruising speed of all personal mobility devices at 12 sampling locations in off-street cycling facilities and multi-use paths in metropolitan Vancouver

Dataset 3
Classified count and cruising speed of all personal mobility devices similar to dataset 1

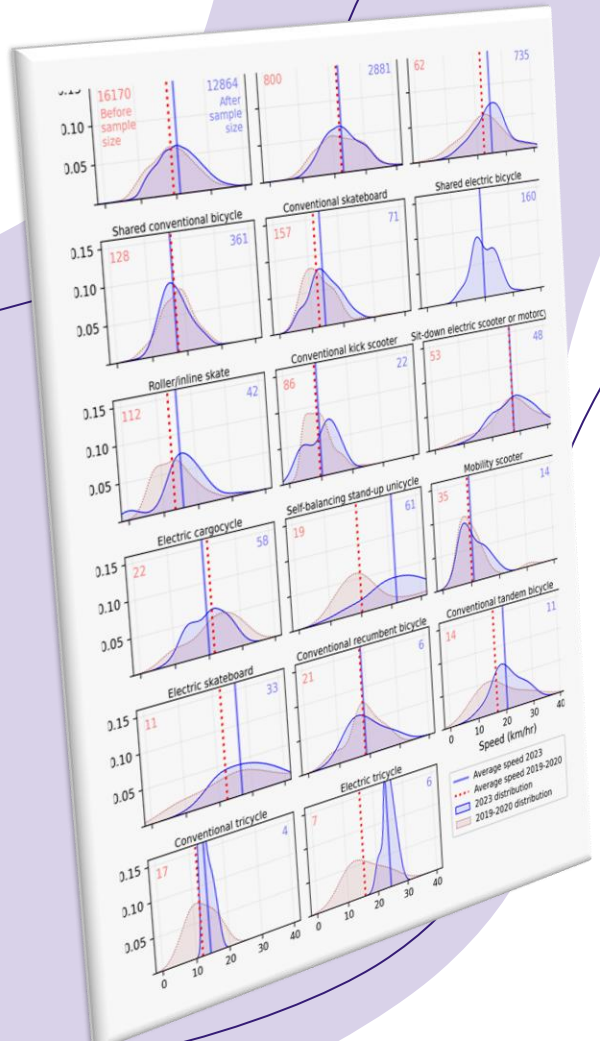
DATASET 1 & 3

- Classified count and speed of all micromobility devices
- ~18k observations in 2019-2020
- ~18k observations in 2023

DATASET 2

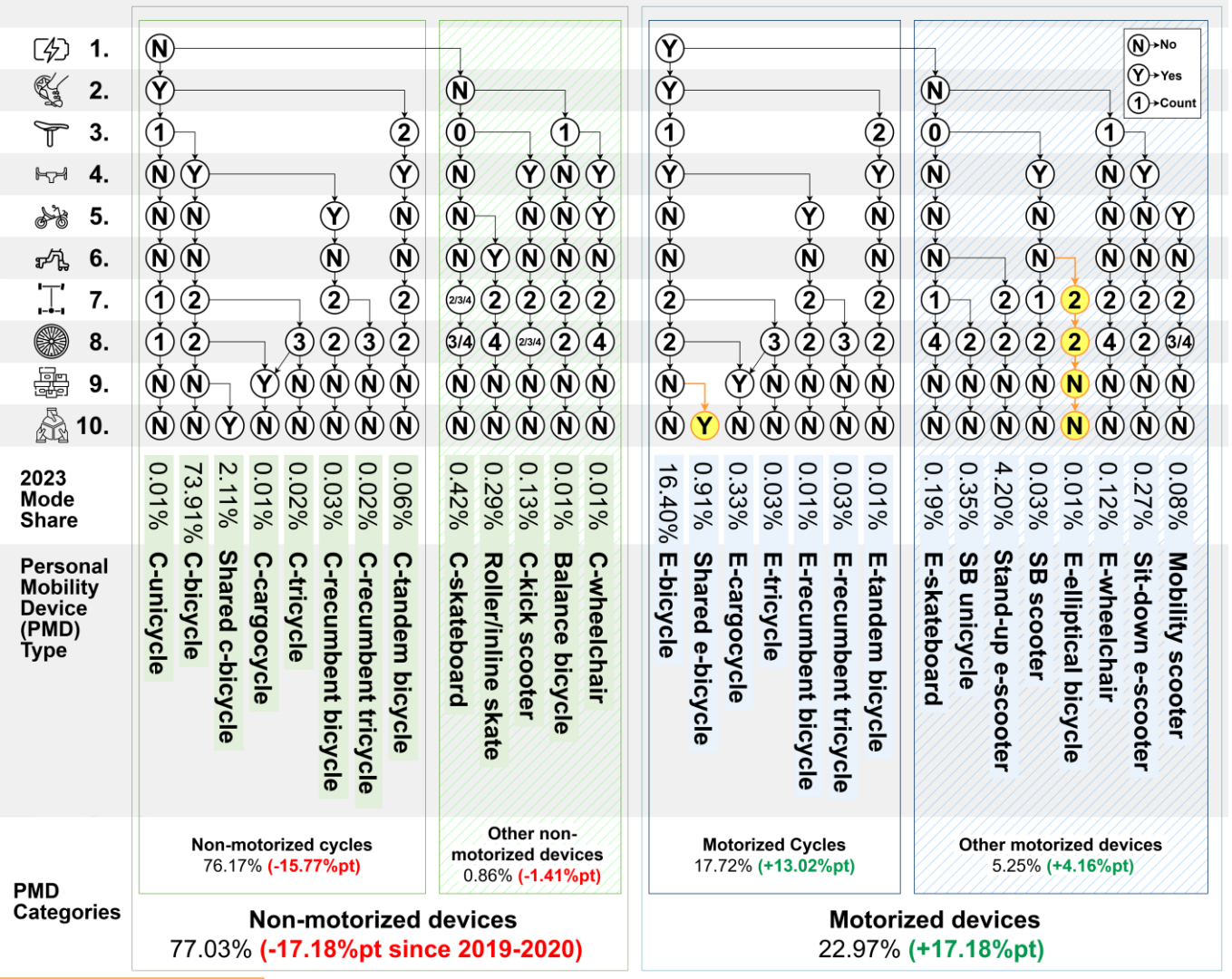


- Perception survey of travellers
- ~1.1k survey responses


16170
Before sample size
12864
After sample size
800
2881
62
735
Shared conventional bicycle
128
361
Conventional skateboard
157
71
Shared electric bicycle
160
Roller/inline skate
112
42
Conventional kick scooter
86
22
Sit-down electric scooter or motorc
53
48
Electric cargocycle
22
58
Self-balancing stand-up unicycle
19
61
Mobility scooter
35
14
Electric skateboard
11
33
Conventional recumbent bicycle
21
6
Conventional tandem bicycle
14
11
Conventional tricycle
17
4
Electric tricycle
7
6
0.15
0.10
0.05
0
10
20
30
40
Speed (km/hr)
Average speed 2023
Average speed 2019-2020
2023 distribution
2019-2020 distribution

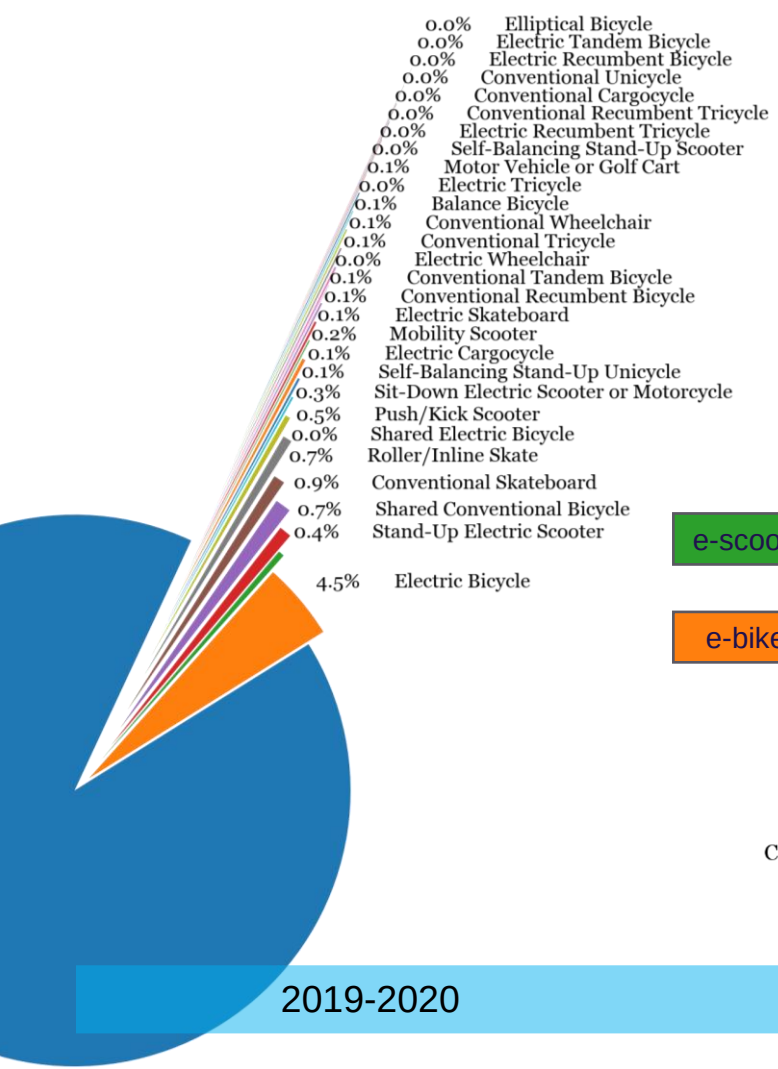
RESULTS

TAXONOMY



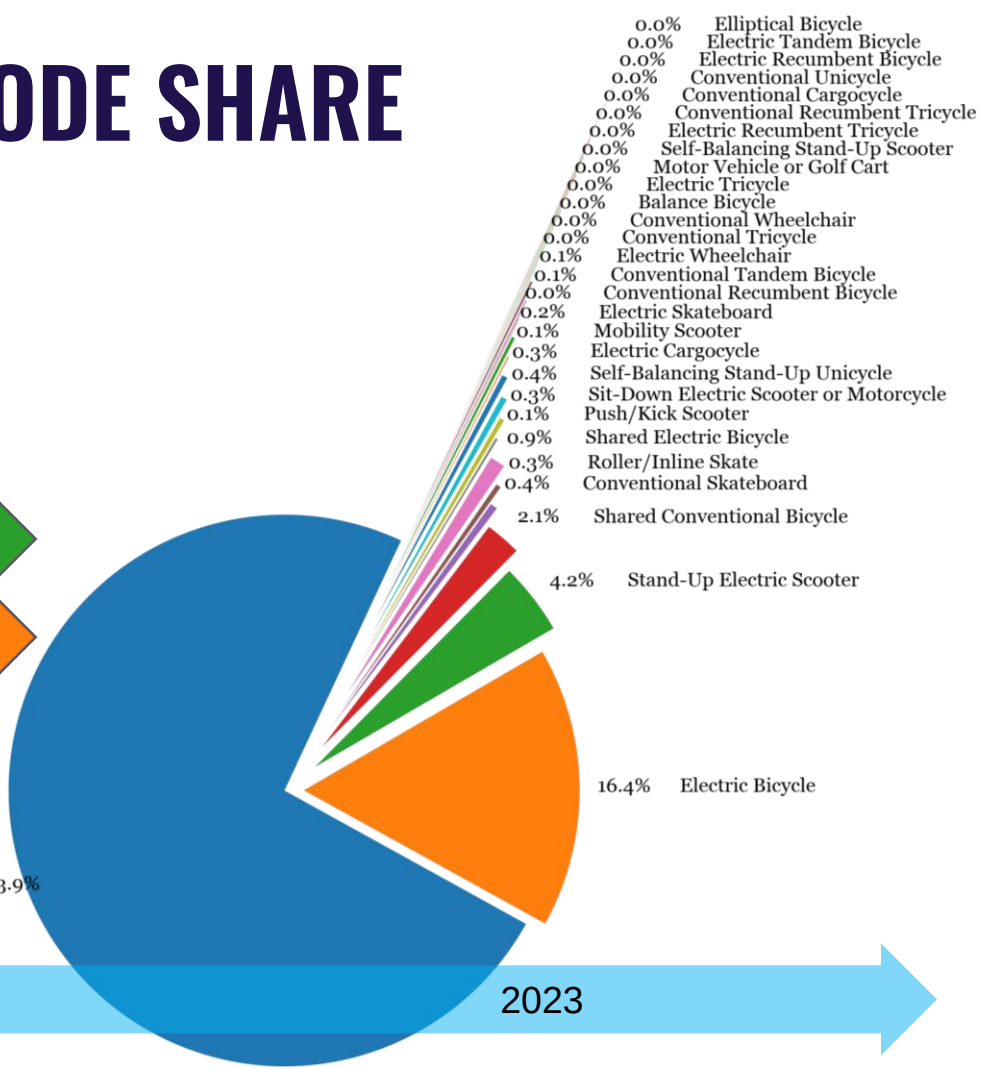
Two new taxons of electric shared bicycle and electric elliptical bicycle were observed in 2023

MODE SHARE



e-scooters +4%p

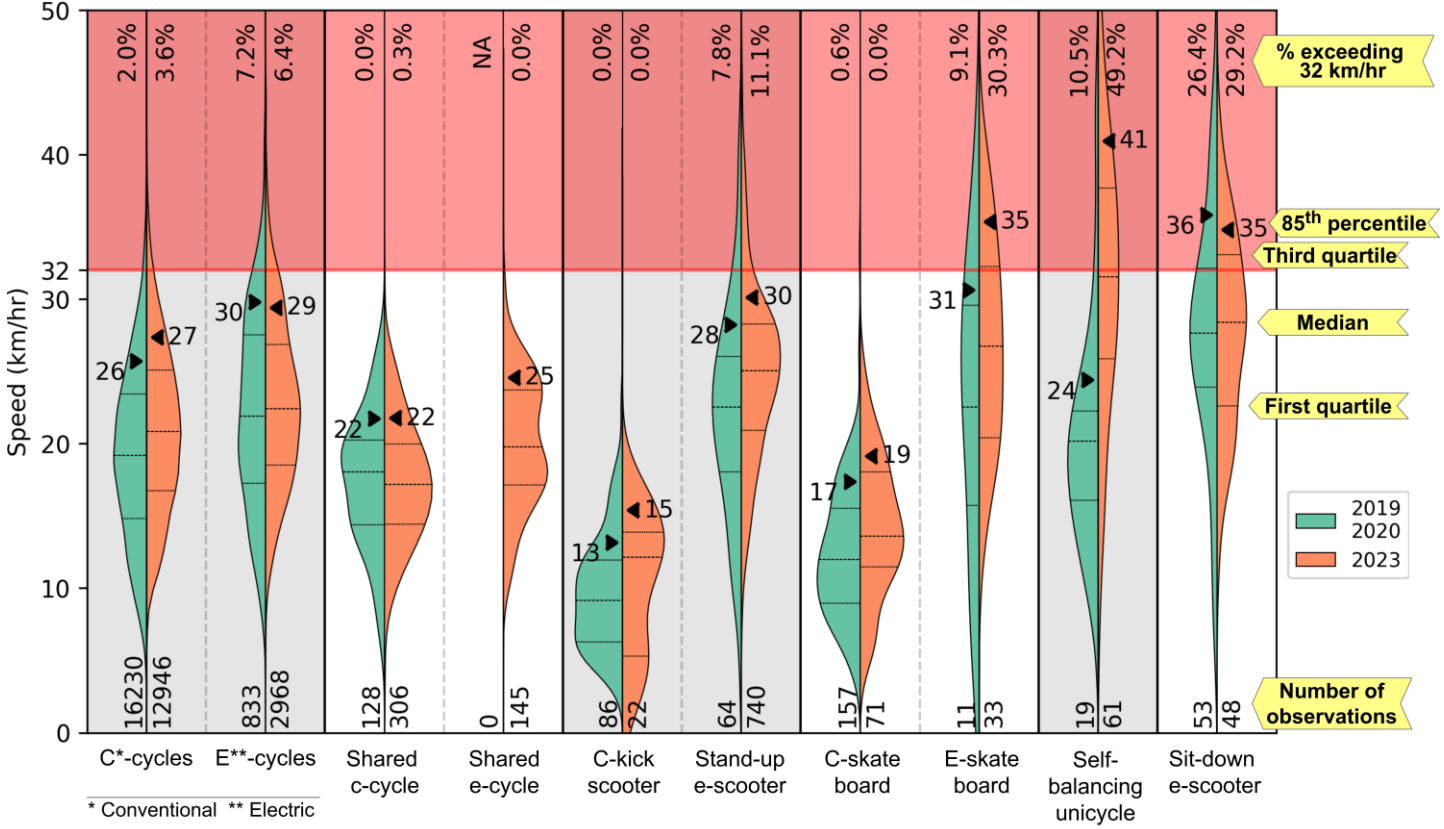
e-bikes +12%p



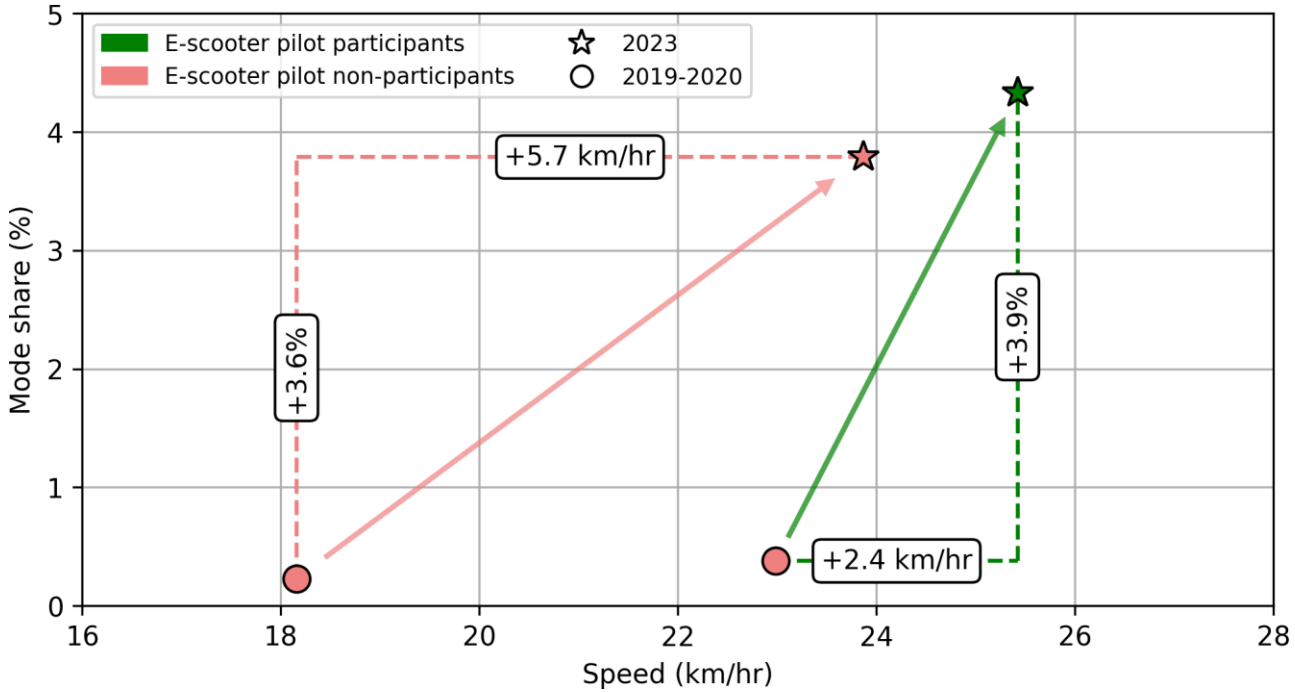
2019-2020

2023

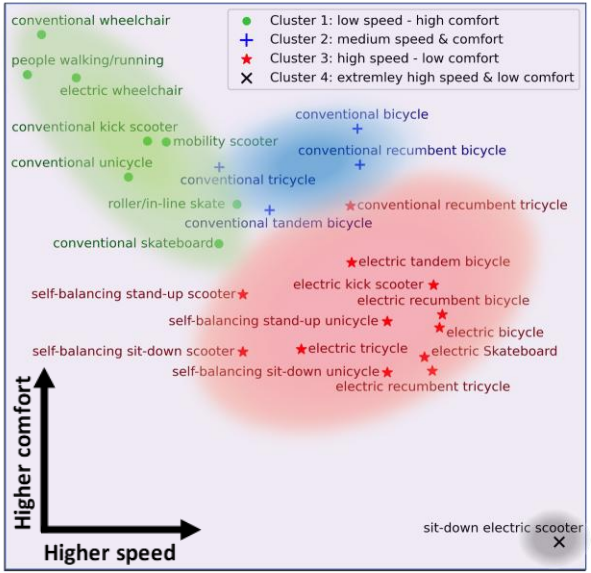
SPEED

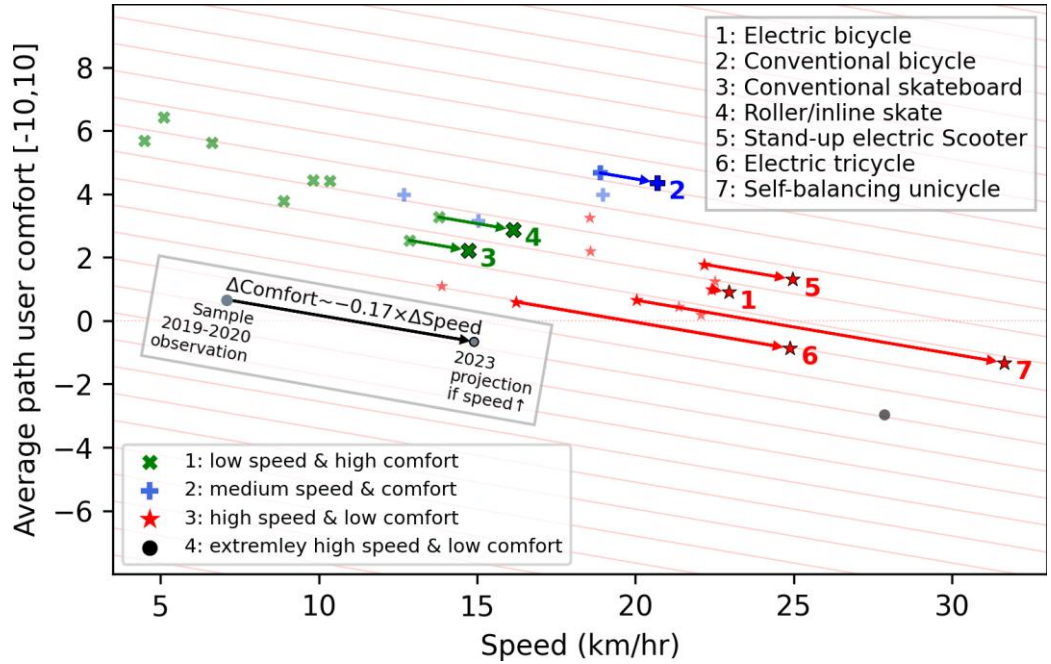

Speed (km/hr)
50
40
32
30
20
10
0
2.0%
3.6%
7.2%
6.4%
0.0%
0.3%
NA
0.0%
0.0%
0.0%
7.8%
11.1%
0.6%
0.0%
9.1%
30.3%
10.5%
49.2%
26.4%
29.2%
% exceeding 32 km/hr
85th percentile
Third quartile
Median
First quartile
2019
2020
2023
Number of observations
26
27
30
29
22
22
25
13
15
28
30
17
19
31
35
24
41
36
35
16230
12946
833
2968
128
306
0
145
86
22
64
740
157
71
11
33
19
61
53
48
C*-cycles
E**-cycles
Shared c-cycle
Shared e-cycle
C-kick scooter
Stand-up e-scooter
C-skate board
E-skate board
Self-balancing unicycle
Sit-down e-scooter
* Conventional ** Electric

E-SCOOTER PILOT



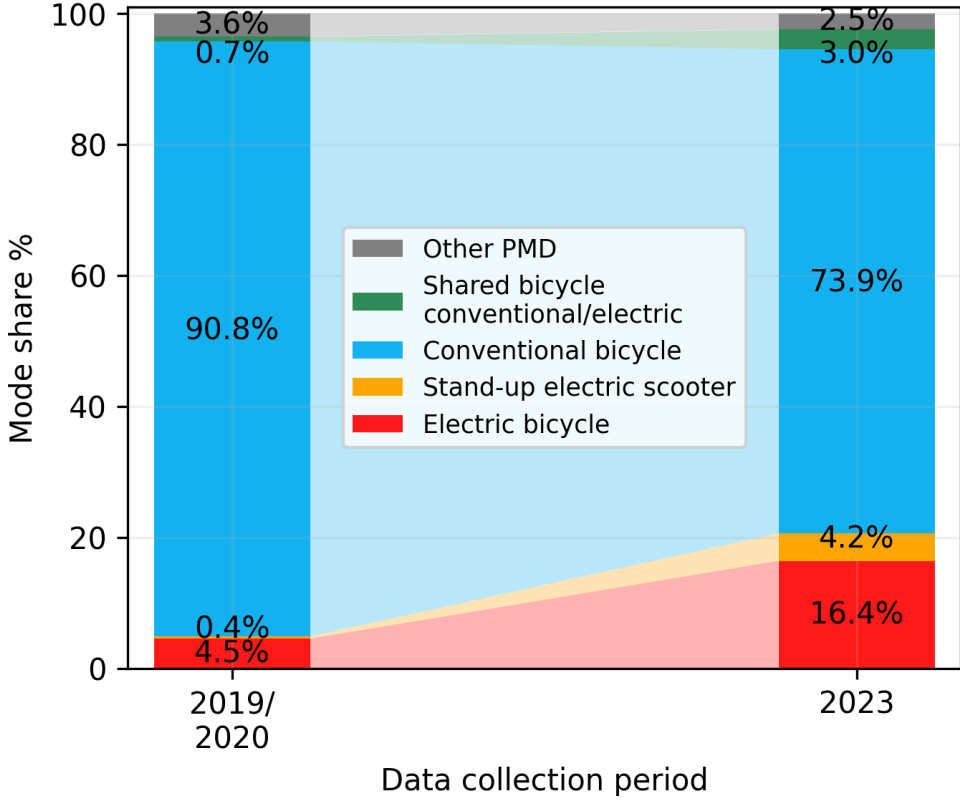
COMFORT


Cluster 1: low speed - high comfort
Cluster 2: medium speed & comfort
Cluster 3: high speed - low comfort
Cluster 4: extremley high speed & low comfort
conventional wheelchair
people walking/running
electric wheelchair
conventional kick scooter
mobility scooter
conventional unicycle
conventional bicycle
conventional recumbent bicycle
conventional tricycle
roller/in-line skate
conventional recumbent tricycle
conventional tandem bicycle
conventional skateboard
electric tandem bicycle
electric kick scooter
self-balancing stand-up scooter
electric recumbent bicycle
self-balancing stand-up unicycle
electric bicycle
self-balancing sit-down scooter
electric tricycle
electric Skateboard
self-balancing sit-down unicycle
electric recumbent tricycle
sit-down electric scooter
Higher comfort
Higher speed


1: Electric bicycle
2: Conventional bicycle
3: Conventional skateboard
4: Roller/inline skate
5: Stand-up electric Scooter
6: Electric tricycle
7: Self-balancing unicycle
ΔComfort~−0.17×ΔSpeed
Sample 2019-2020 observation
2023 projection if speed↑
1: low speed & high comfort
2: medium speed & comfort
3: high speed & low comfort
4: extremley high speed & low comfort
Average path user comfort [-10,10]
Speed (km/hr)

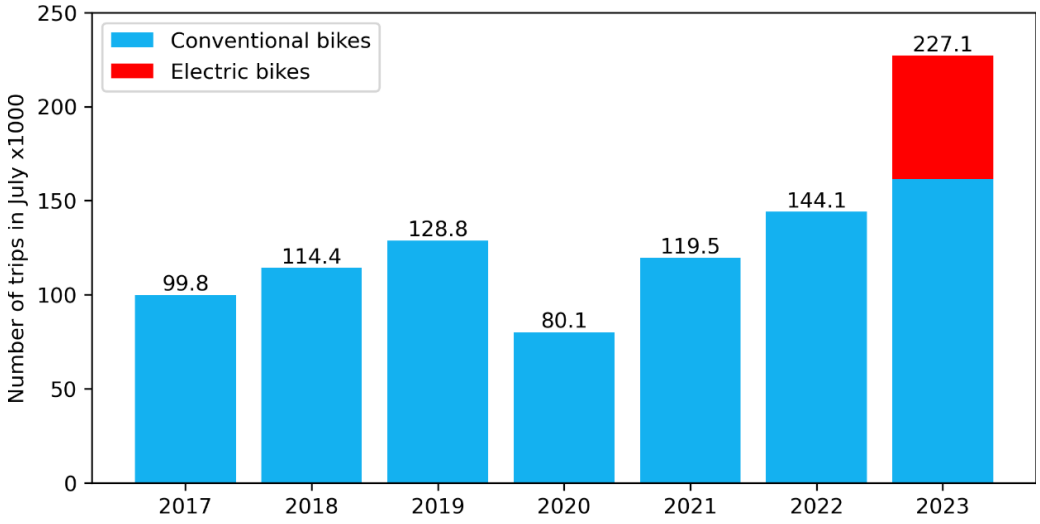
KEY FINDINGS & CONCLUSIONS

I.
The mode share of motorized PMD has quadrupled in 4 years

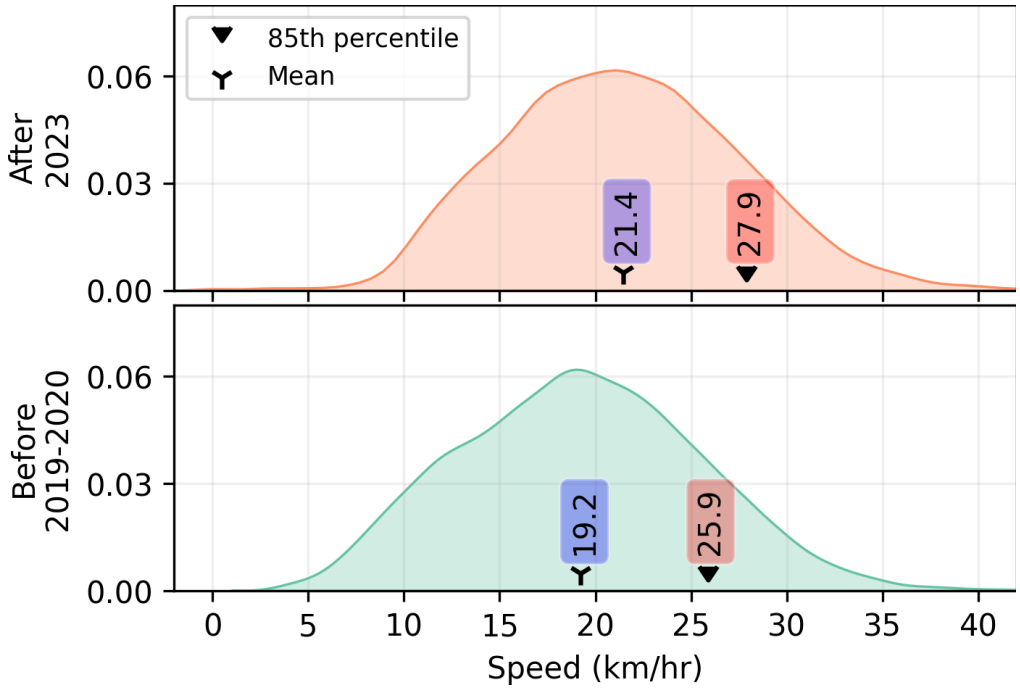


II.
Bikeshare represents a small but increasing portion of PMD use.

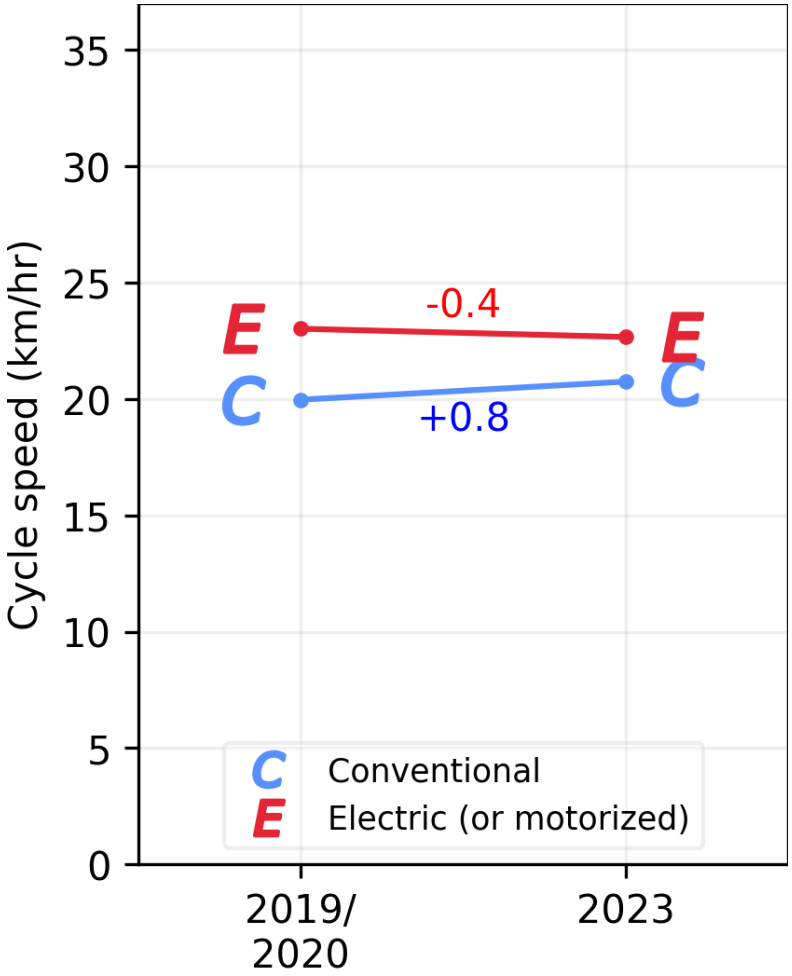
	Shared versus 100 personal devices	
	2019-2020	2023
Conventional bicycles	**0.8**	**2.8**
Electric bicycles	**0.0**	**5.5**



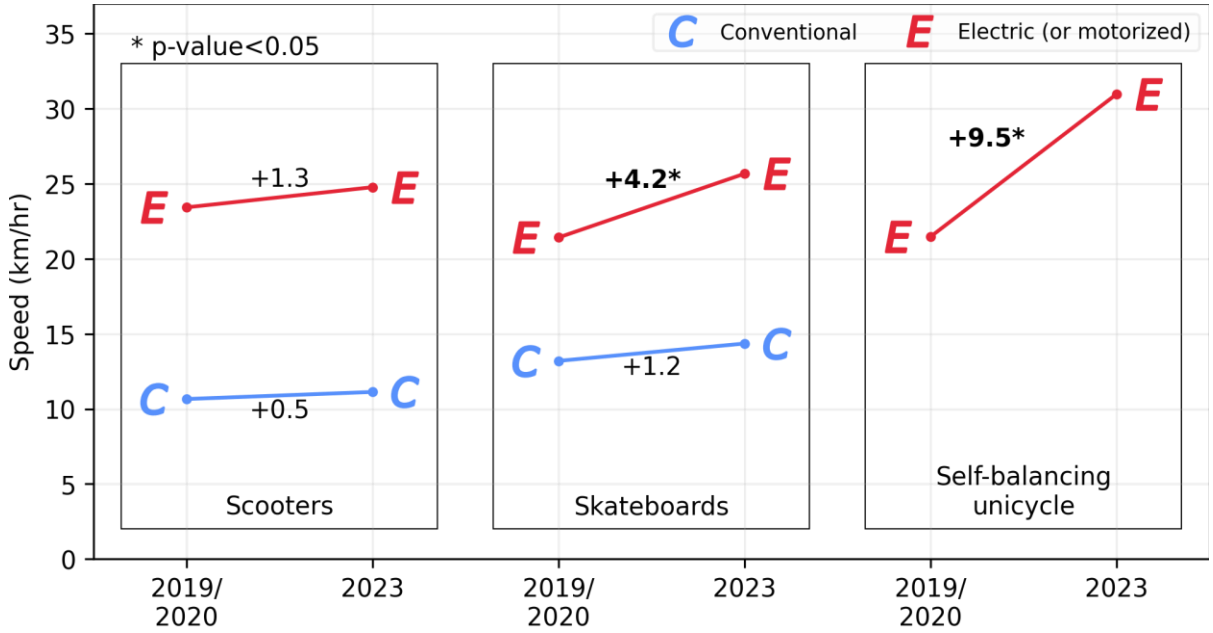
III.
The average speed in off-street facilities increased by 11% or 2 km/hr



IV. Conventional and electric bicycle speeds are more similar now

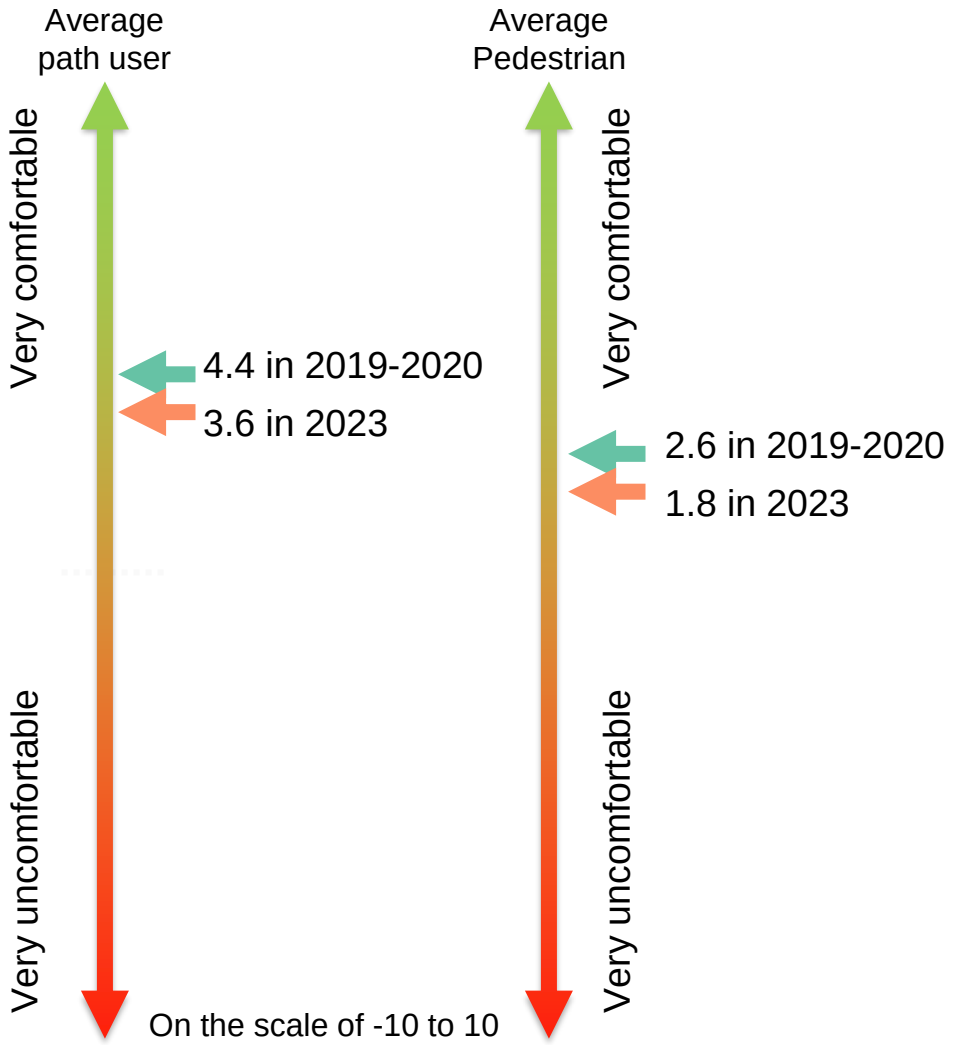


V.
Speeds increased dramatically for some less common motorized PMD



VI.
Mode share and speed changes will degrade path user comfort,

but paths are still moderately comfortable on average



CONCLUSIONS

- The region can still **accommodate new mobility devices**.
- The **32 km/hr** motor-assist limit for electric cycles **is still effective**.
- The **24 km/hr** motor-assist limit for stand-up electric scooters has **not been effective.**
- The **30 km/hr** design speed is **still marginally conservative and appropriate**.
- We should mitigate the impacts of self-balancing unicycles and electric skateboards, either through **speed management** or **removal** from off-street facilities.
- Increased pedestrian discomfort supports **lowering the volume thresholds** for separation of pedestrians and PMD.

THANKS

Do you have any questions?
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