

Workshop

Mind the Hub

Hoe de perfecte hub te ontwerpen
vanuit een gebruikersperspectief?



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The future of mobility



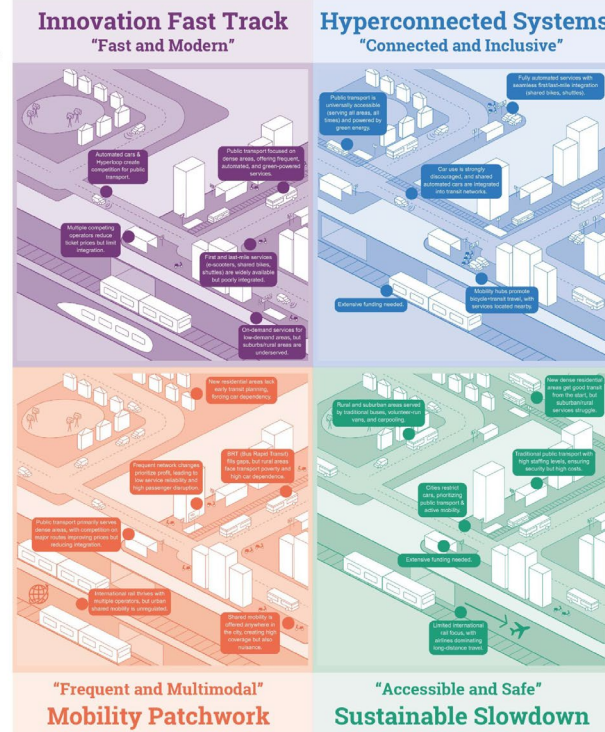
The Future of Public Transport

Societal openness to (technological) change

Society is embracing new technologies

Society is cautious towards new technologies

With the team of the TU Delft Mobilisers, 4 future mobility scenarios were developed and presented. These scenarios are no predictions or desired future, but a framework to discuss future directions, shaping the future of mobility, and innovation, research and education agendas accordingly.



All references:



<https://nielsvanoort weblog.tudelft.nl/the-future-of-public-transport-2/>

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More details:

Integrated shared micromobility + transit: Bhogus et al. (2023) Spennberg et al. (2024)

On demand mobility: Gerzinc et al. (2022) Coudinho et al. (2022)

Inclusive mobility: Bon et al. (2022) Bruno et al. (2024)

Mobility hubs and shared mobility: Torralba et al. (2023) Van der Linden et al. (2025) Xenopoulos et al. (2024)

BRT and light rail: Van der Bijl and Van Oort (2024) Van der Bijl et al. (2018)

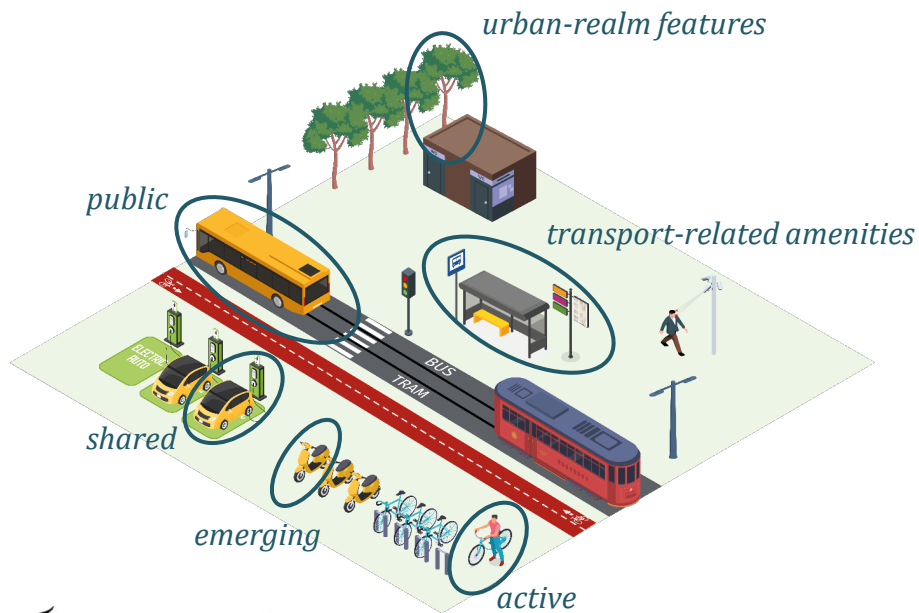
All references:

<https://nielsvanoort weblog.tudelft.nl/the-future-of-public-transport-2/>





What is a mobility hub?



“

A recognisable place with an offer of different and connected transport modes supplemented with enhanced facilities and information features to both attract and benefit the traveller.

— CoMoUK, 2019

“

A centre designed to provide a safe and comfortable transition for passengers between modes by providing a focal point in the transport network.

— Aydin et al., 2022



Why a mobility hub?

“

Around a quarter of global energy-related CO₂ emissions come from the transport sector, in which the car is the leading contributor.

— Intergovernmental Panel on Climate Change

“

95% of the time, space is occupied by parked private cars, whilst only 5% of the time they are actually used.

— Shoup, 2017



Low-car paradigm

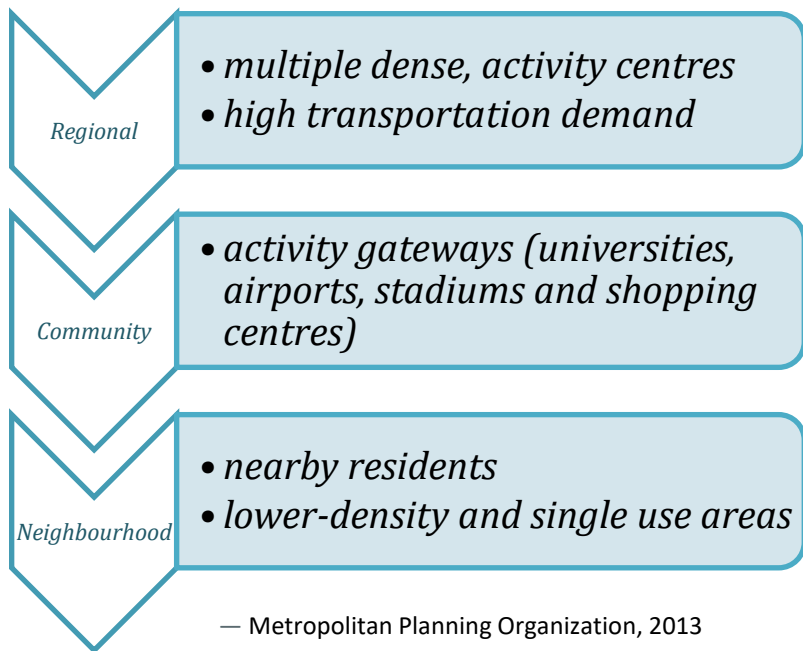


Mobility hubs

- Mobility infrastructure and alternatives
- Multimodality and intermodality
- No need for private car ownership



What are the types of a mobility hub?



Different classifications are based on multiple criteria such as size, location, density served, trip direction (outgoing, transit, entering), number of modes and facilities.

— Hachette & L'Hostis, 2024





What are potential attributes of a mobility hub?

Safety

*dedicated crossings; adequate lighting; CCTV;
security personnel; search and rescue dogs;
emergency buttons; emergency exits;
pavement quality; slope*

*Protection against theft and crime
Personal security
Safer pedestrian movement
Less fear and uncertainty
Improved accessibility*

Comfort

*transparent waiting areas; shelters; seating;
luggage lockers; charging points; dustbins;
ATMs; Wi-Fi; air conditioning; toilets; drinking
water points; care rooms; greenery; catering
facilities; cleanliness; air quality; noise levels;
architectural design; cultural and heritage
elements*

*Basic needs
Thermal and visual comfort
Improved attractiveness and ease of use
More pleasant and supportive environment*

Both

*wayfinding; signage; colour differentiation;
land-use diversity; surrounding shops;
extended opening hours; less crowding;
sectioned areas; clear exit routes; maps; real-
time information; information kiosks; public
telephones*

*Improved navigability, autonomy and
confidence in using the hub
Reduced confusion and stress
Enhanced liveability and environmental
quality*



MOTIVATION

The 2040 ambition — and the gap to close

“

By 2040, travel in the Netherlands will be fast, sustainable, safe, comfortable, reliable and affordable — with public transport an essential component focused on passengers and their door-to-door journeys.

— Ministry of Infrastructure & Water Management, 2019

0.8 → 1.1 Car ownership rose vehicles per household (1990–2022)

49% Private cars still make up of all trips

> 90% Parked cars sit idle of the day

Reaching the vision needs behavioural change, not just technology — sustainable options must become the default choice.



Access & egress at a hub

293 travellers · Delft Campus



Living in a car-free zone

138 residents · Delft centre



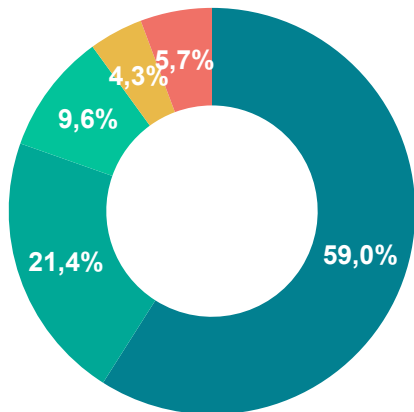
Older adults (50+)

418 people · 45 Dutch cities



Shared bikes win the first & last mile — and cost rules

Predicted use of access/egress modes



■ Shared (e-)bike ■ Shared e-step ■ Shared e-scooter
■ Individual AV ■ Collective AV



Bikes lead, AVs trail

Shared bikes ~59% of trips; autonomous vehicles reach only ~10% combined.



AVs users are price-sensitive

Cost elasticity -3.3 for individual AVs — competitive pricing is decisive.



Demographics split demand

High-income & higher educated users favour AVs; younger & older users avoid e-scooters and AVs.

For hubs: reserve at least half the capacity for shared bikes in cycling regions and keep pricing simple and low.



LESSON 2 · CAR-FREE ZONES

Most residents tend to opt out of shared modes— and that is the finding

!64%

of respondents opted out of
shared modes entirely

*Highest
among older (84% are aged 50+),
affluent, highly-educated residents*



Strong car dependence

Car owners: 72% vs 45% car-owning households opt out far more than car-free ones.

Cars dominate long trips, bad weather, heavy loads & family travel — led by middle-aged men.



Scooter sharing most attractive

But higher cost and longer walking distances sharply reduce uptake.



Proximity vs price

Walking-distance value of time $\approx$ €0.20/min — proximity matters almost as much as cost.

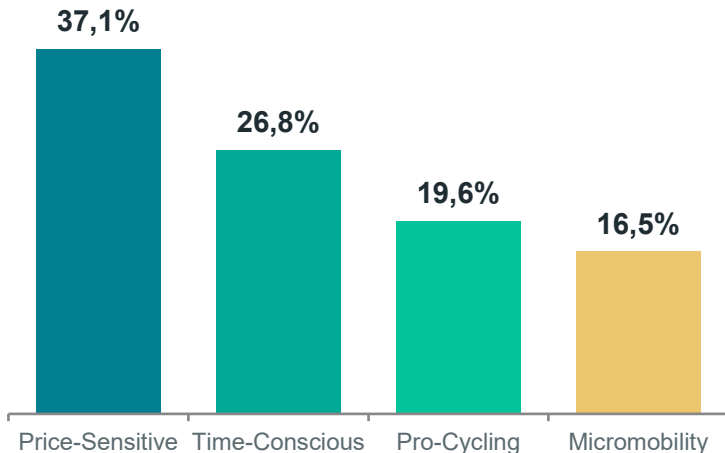
For hubs: restricting cars without an easy, close, trusted alternative
suppresses trips

PUT THE HUB IN THE RIGHT PLACE FIRST



There is no average user

Older adults (50+) split into four groups



37%

Price-Sensitive & Undecided

Car-dependent; limited digital & physical capacity

27%

Time-Conscious

Prefer e-bikes for leisure & shopping

20%

Pro-Cycling & Conventional

Multimodal; least car-dependent

16%

Micromobility Enthusiasts

Open to alternatives, but price-constrained

One hub, a mix of modes — not one flagship mode for an average user.



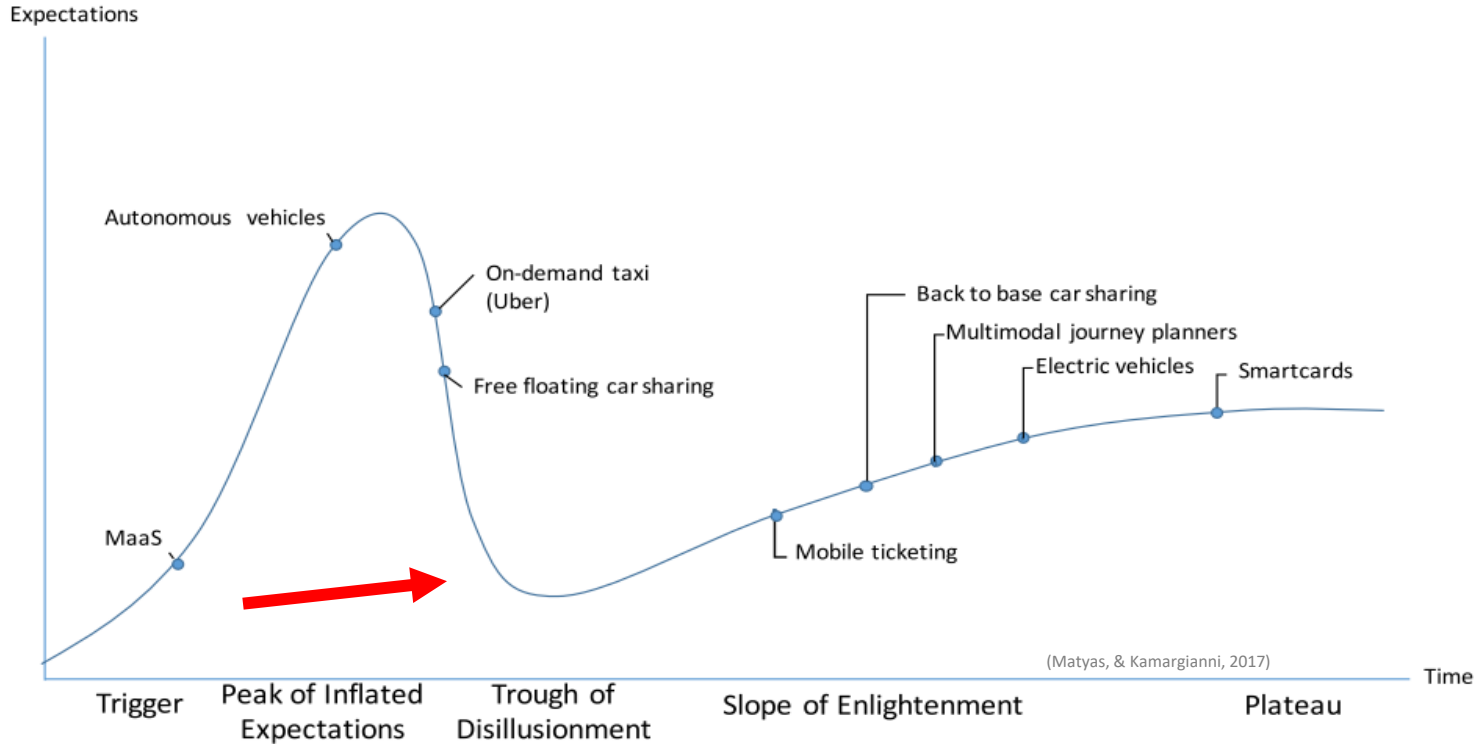
CONCLUSIONS

Five recommendations for policy & design

What travellers want, hubs must supply

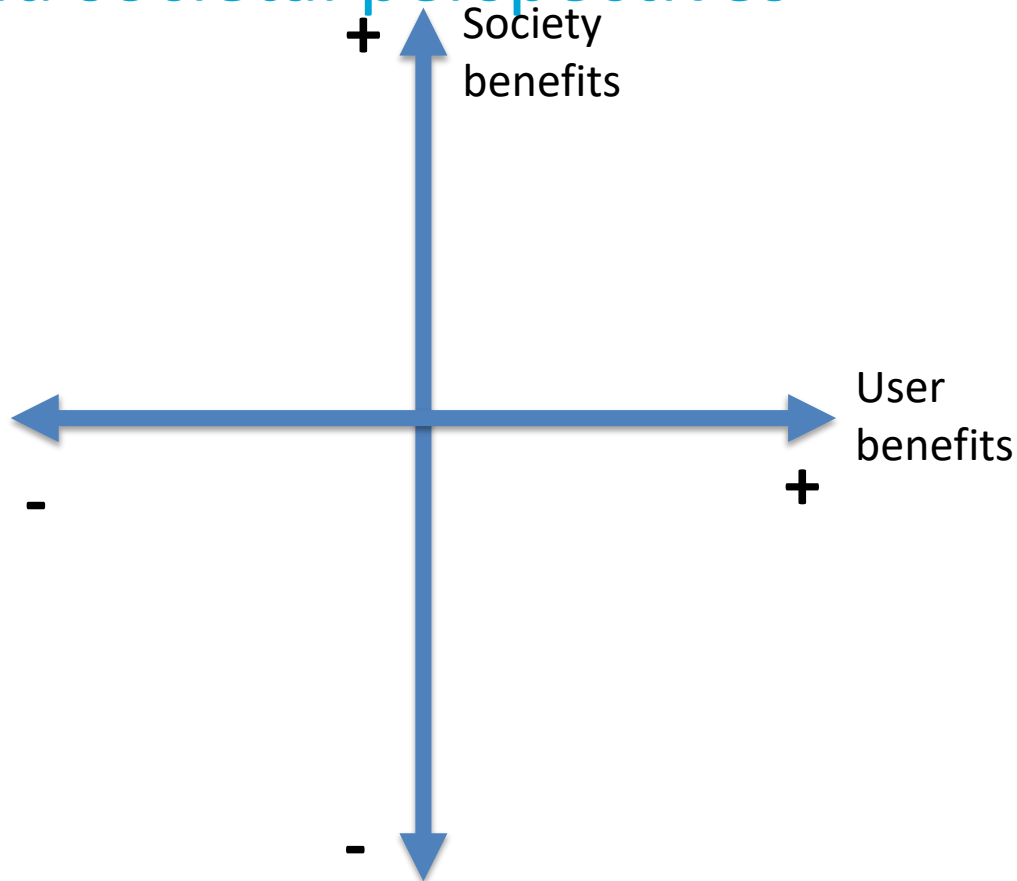
- 1 Understand people, not just technology** Behavioural insight — not infrastructure alone — determines adoption.
- 2 Design hubs as system integrators** Treat mobility hubs as network nodes, not mere transfer points.
- 3 Make it easy and close to home** Proximity and simplicity are as decisive as price.
Short walking distance is decisive — dense, small hubs beat a few big ones.
- 4 Keep it affordable** Shared mobility must stay price-competitive with the private car.
- 5 Leave no one behind** Design for all ages, incomes and digital skill levels.

Mobility hubs: Hype or not?



Expected Hub benefits?

User and societal perspectives



Welke 4 voorzieningen?

Belangrijkste: 5 kruisjes

2 kruisjes

1 kruisje (2x)



Welke 4 vervoermiddelen?

Belangrijkste: 5 kruisjes

2 kruisjes

1 kruisje (2x)



Automated vehicle
(collective)



Shared e-bike

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