Autobus project

Institute of Transport Economics
Norwegian Centre for Transport Research

Agenda

- 09:00–09:10 **Welcome – general project presentation** (Torkel Bjørnskau, TØI)
- 09:10–09:30 **European pilots with AV shuttles** (Irene Zubin, TU Delft)
- 09:30–09:50 **Field survey results** (Torkel Bjørnskau, TØI)
- 09:50–10:00 ***BREAK***
- 10:00–10:20 **Video analysis – interactions with cars** (Carl Johnsson, Lund University)
- 10:20–10:40 **Video analysis – interactions with VRUs** (Tim De Ceunynck, on behalf of Vias Institute)
- 10:40–10:50 ***BREAK***
- 10:50–11:05 **The future of autonomous public transport** (Ruter, Applied Autonomy, Kolumbus)
- 11:05–11:30 **Poll and concluding remarks**

The Autobus project

- Research question:
  - *How do other road users interact with self-driving buses?*
  - *Does the way of interacting change over time?*
- Method:
  - *Video observations and field interviews (repeated)*
- 3 test routes in real traffic in Norway: Forus, Kongsberg, Oslo
- International research consortium:
  - *TØI, TU Delft, Lund Univ., Vias institute, Applied Autonomy, Univ. of Southeast Norway*
- Funded by:
  - *The Research Council of Norway, The Norwegian Public Roads Administration, Public Transport Companies (Ruter, Kolumbus) and Buskerud county*
- Duration: 2018-2021
- More info at www.toi.no/autobus

Location


Norwegian Sea
Iceland
Sweden
Finland
Norway
Estonia
Moscow
Москва
Baltic Sea
Latvia
North Sea
Lithuania
United Kingdom
Denmark
Ireland
Belarus
Poland
London
Netherlands
Berlin
Germany
Ukraine
Belgium
Prague
Paris
Czechia
Slovakia
Moldova
Vienna
Austria
Hungary
France
Romania
Black S
Croatia
Serbia
Portugal
Italy
Bulgaria
İstanbul
Madrid
Barcelona
Rome
Spain
Tyrrhenian Sea
Greece

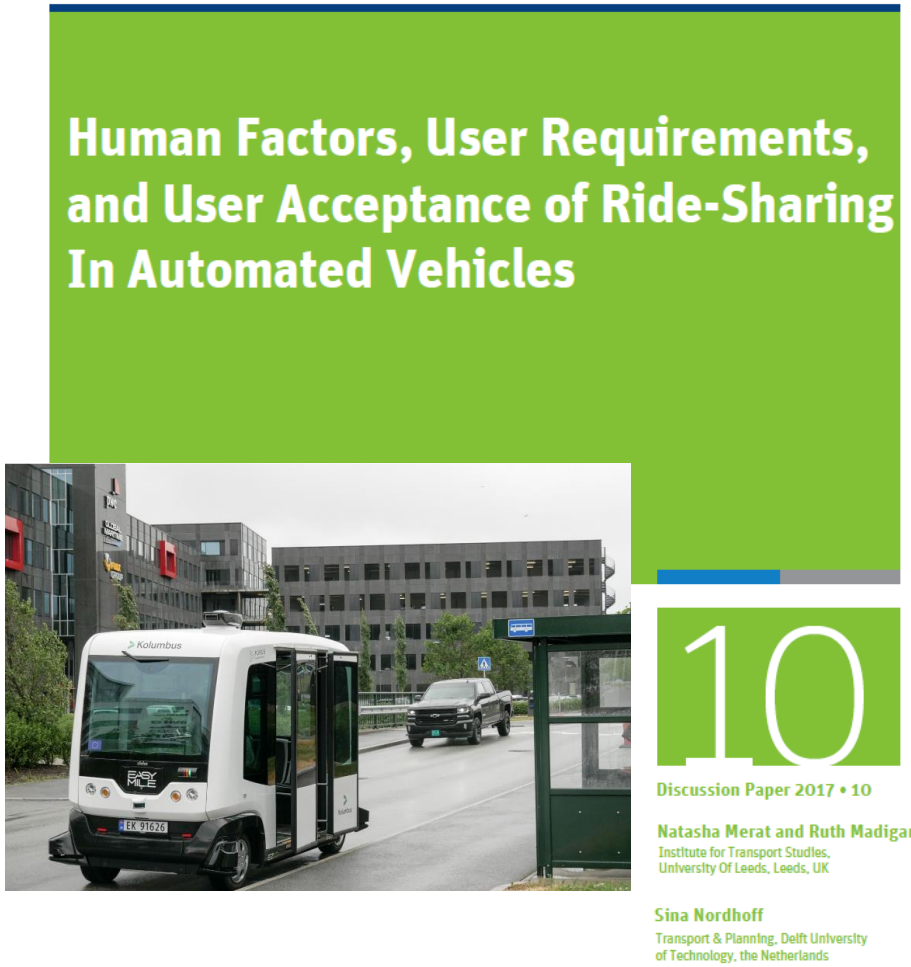

Alesund
Andalsnes
Oppdal
Røros
Ulsteinvik
Knutshø
Tolga
Valldalen
Geiranger
Reinheimen
Måløy
Nordfjordeid
Loen
Bismo
Norway
Breheimen
Otta
Florø
Jostedalsbreen Nasjonalpark
Førde
Skei
Jotunheimen Nasjonalpark
Askvoll
Leikanger
Beitostølen
Lillehammer
Gjøvik
Knarvik
Bergen
Fitjar
Leirvik
Kongsberg
Haugesund
Seljord
Moss
Åkrehamn
Skien
Fredrikstad
Sandefjord
Porsgrunn
Halden
Stavanger
Uddevalla
Trollhättan
Skagen
Gothenburg

Autobus project

Theory & research question

Standard research question: User acceptance

International Transport Forum



- Acceptance and trust in technology
  - *Technology Acceptance Model*
  - *Unified Theory of Acceptance and use of Technology*
- Acceptance of shared transport
  - *Privacy, personal space, security ..*
- Passenger experience

Our reseach question: Road user interaction

Journal of Planning Education and Research

Pedestrians, Autonomous Vehicles, and Cities

Adam Millard-Ball

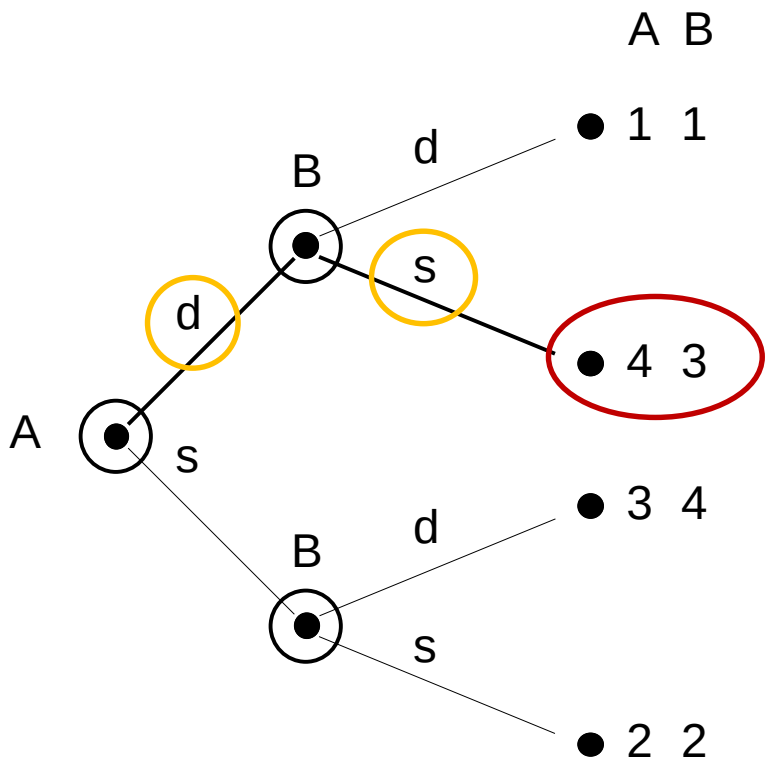
First Published October 27, 2016 | Research Article | Check for updates
https://doi.org/10.1177/0739456X16675674

LEADER – the basic crossroads game

B

A	Drive	Stop
Drive	1, 1	3, 4
Stop	4, 3	2, 2

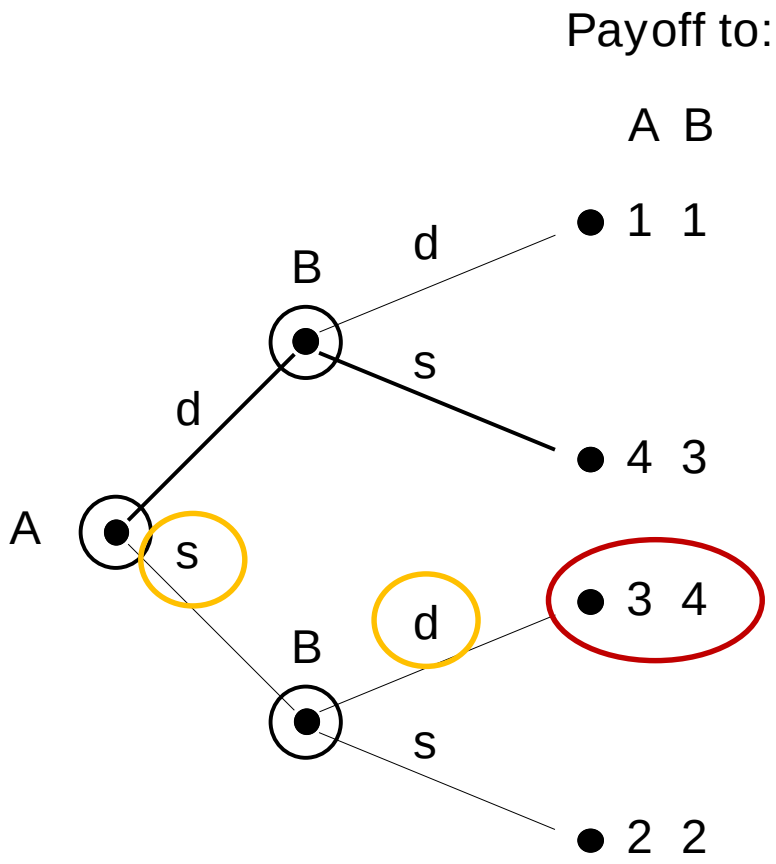
Payoff to:



LEADER – the basic crossroads game

B

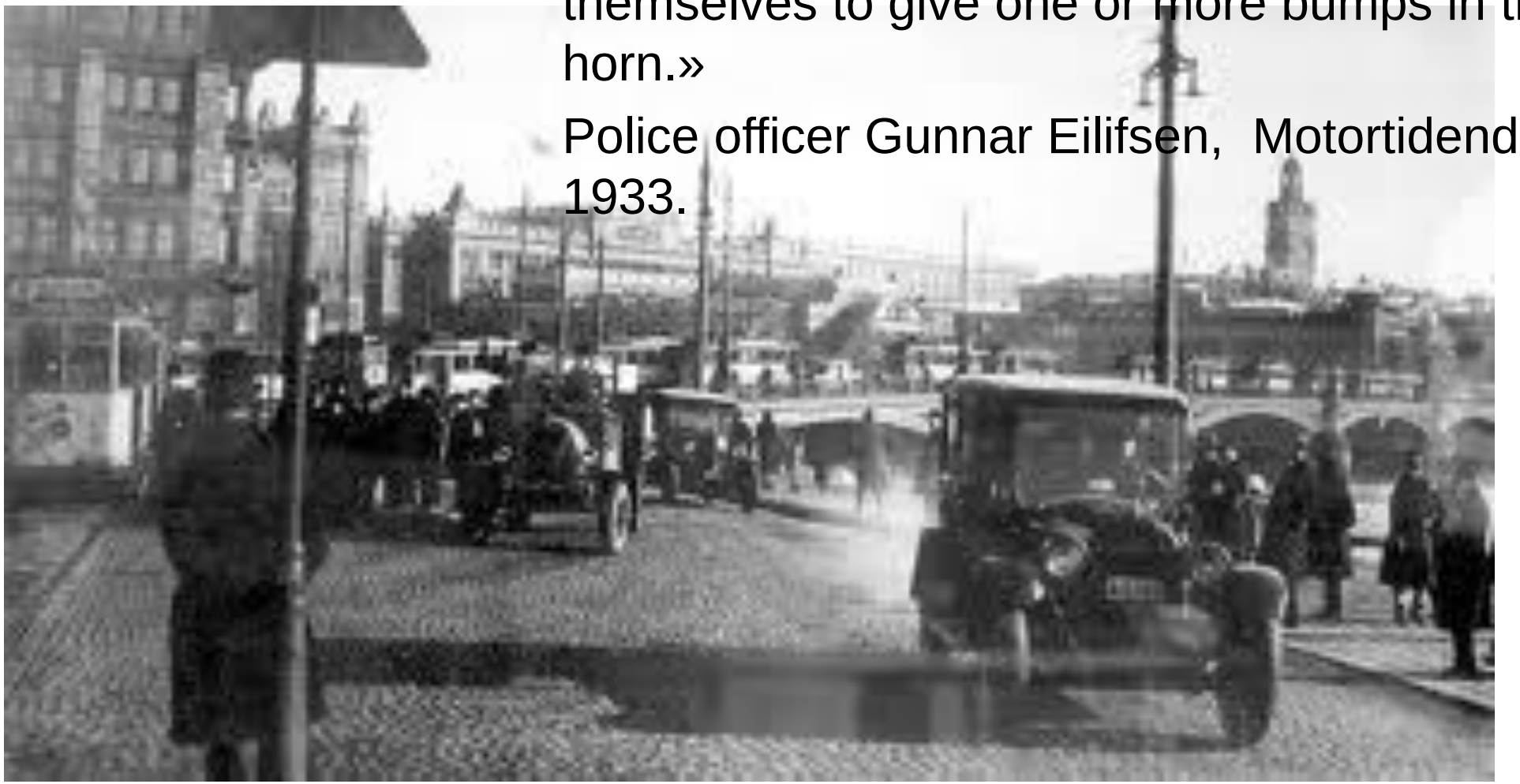
A	Drive	Stop
Drive	1 → 3	4
Stop	1 ↓ 3	4 ← 2 ↑ 2



Signalling

«The chauffeurs drove often as rockets across streets and intersections without the slightest reduction of speed as they only restricted themselves to give one or more bumps in the horn.»

Police officer Gunnar Eilifsen, Motortidende no. 5, 1933.



Kongsberg pilot

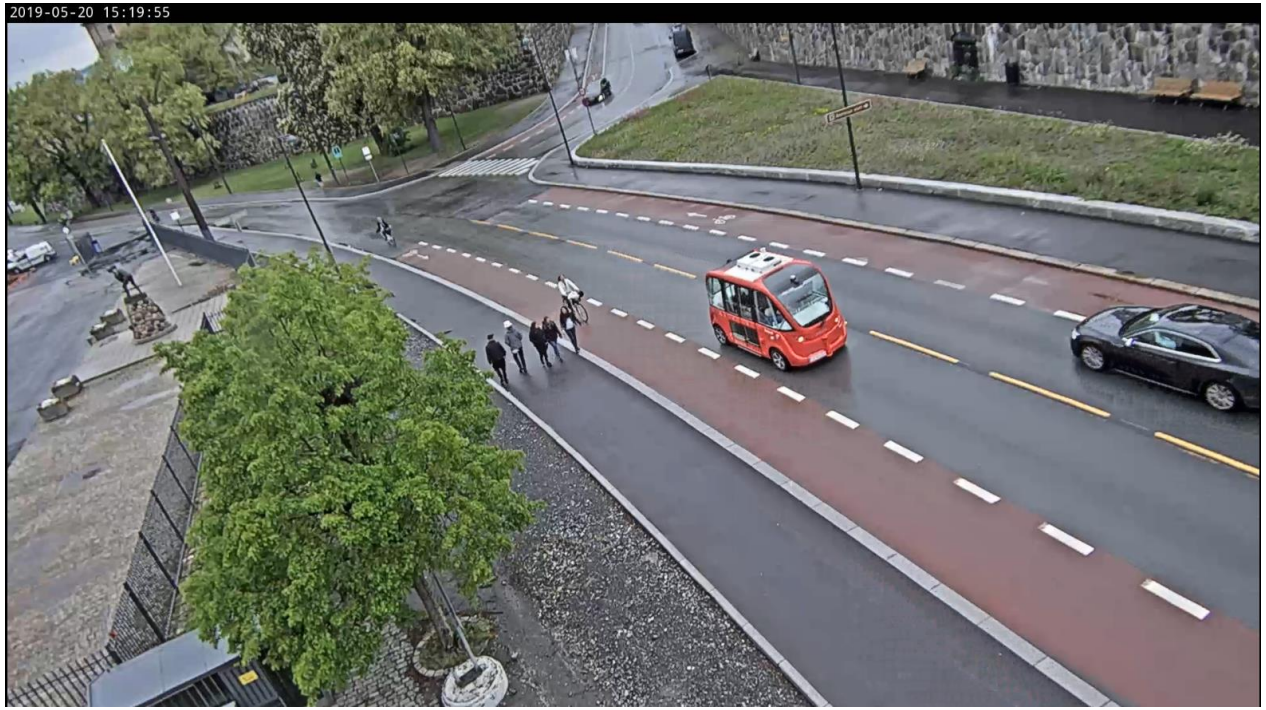
Phase 1 (900m)

Phase 2 (2000m including phase 1)

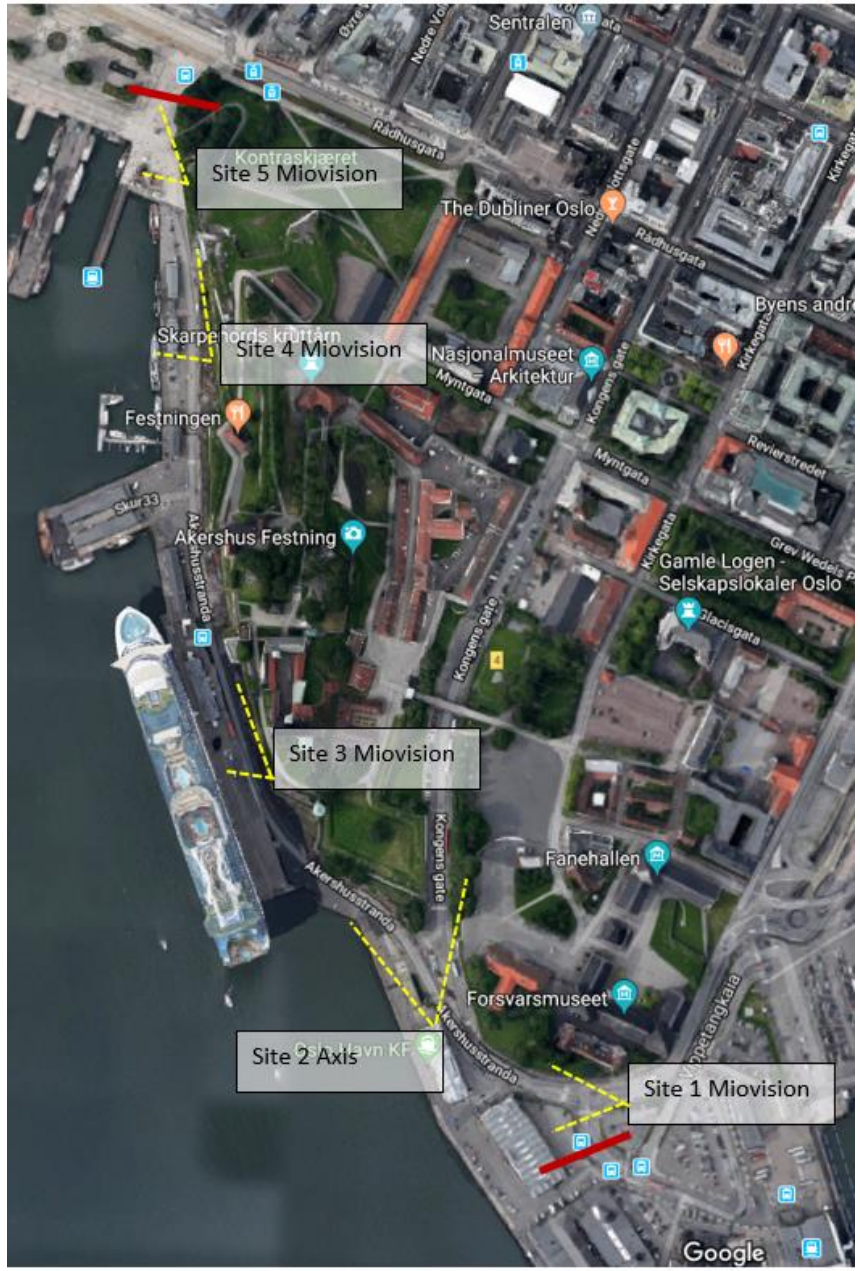
Phase 3 (4400m including phase 1 & 2)

- EasyMile bus in operation from 15. October 2018 (10–14)
- Field surveys in pedestrian street (4 different points in time)
- 3 video cameras

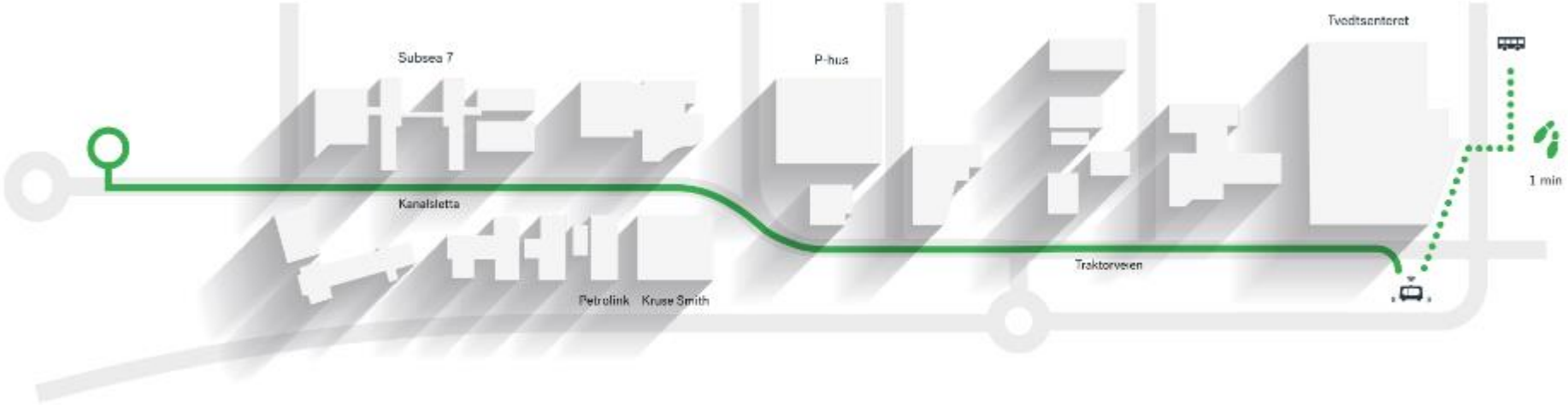
Oslo pilot

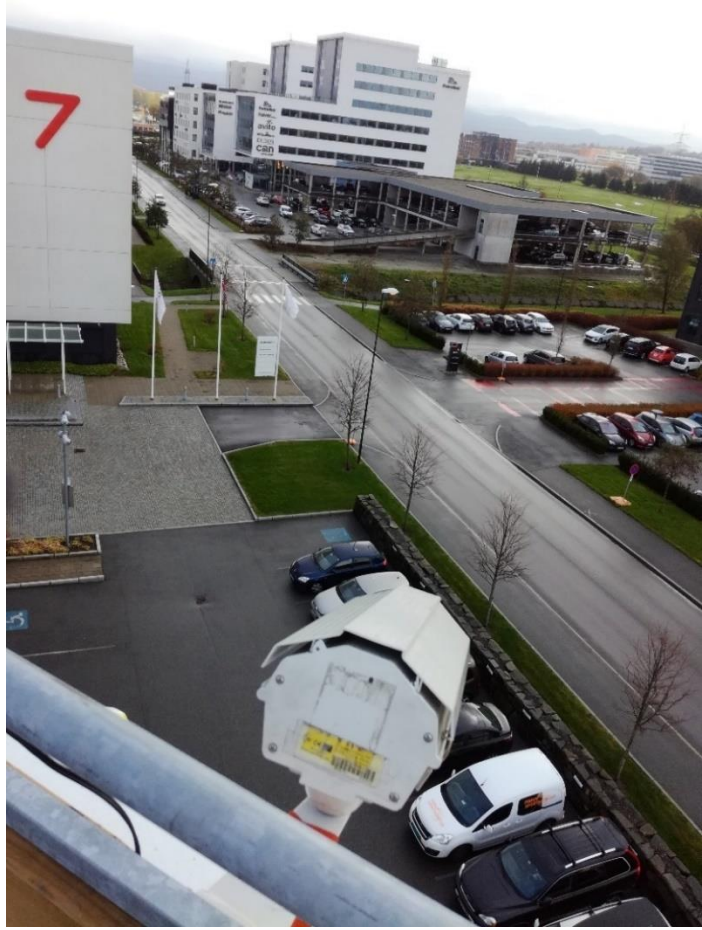


- Navya bus, 1.2 km route
- 20. May – 1. November 2019 (08–20)
- 4 surveys by town hall
- 5 cameras



Forus pilot





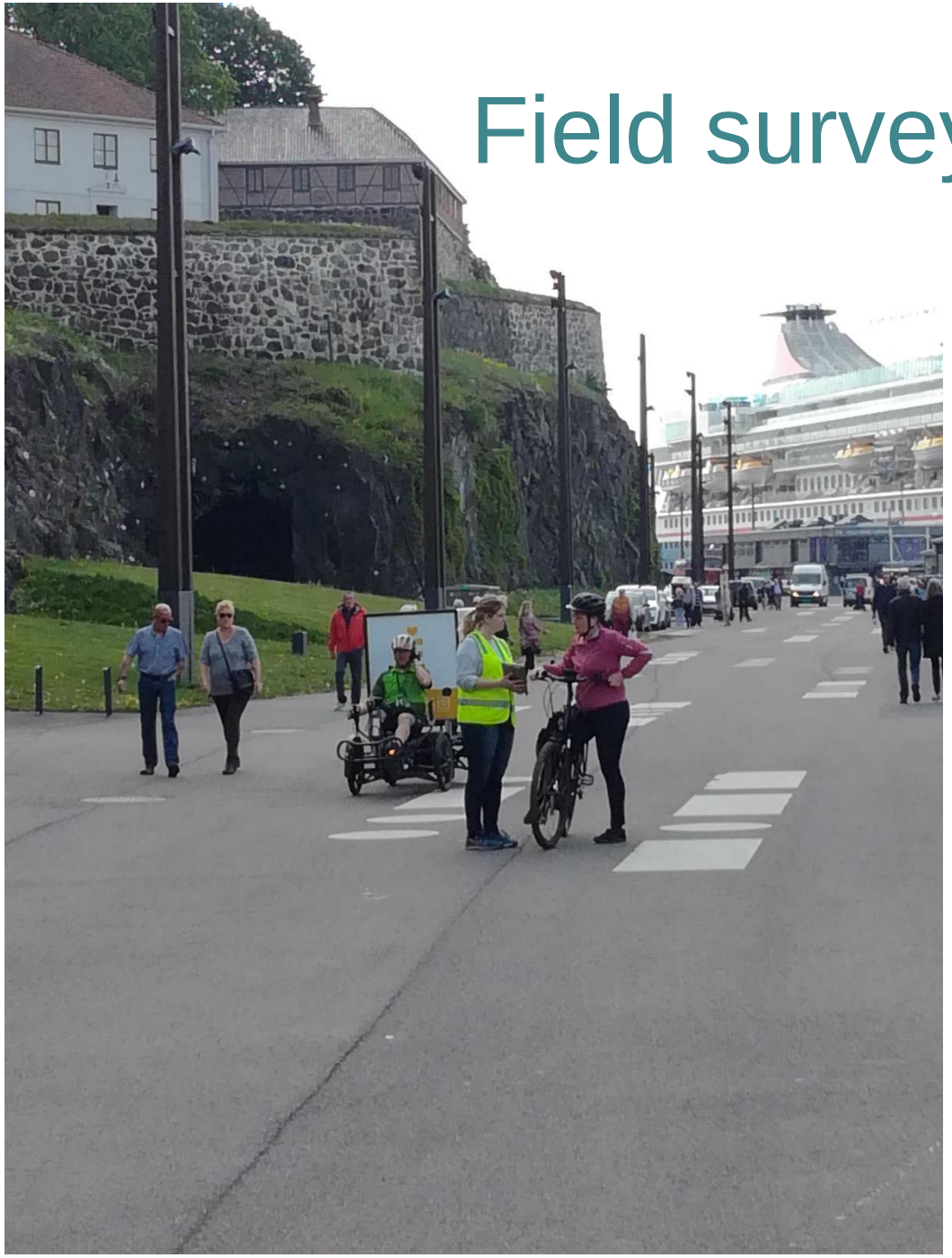
- EasyMile bus – 1.2 km route
- 12. juni – 30. nov 2018 (9–15)
- Survey to employees (N=180) (+ shopping center)
- Two video cameras

«It's too slow, but overall I'm positive.»

Survey results from Forus

Slotsvik, T. N. (2019). Interaksjoner mellom bilister og selvkjørende busser. En systemteoretisk analyse av trafikksikkerhet. Master thesis, Universitetet i Stavanger.

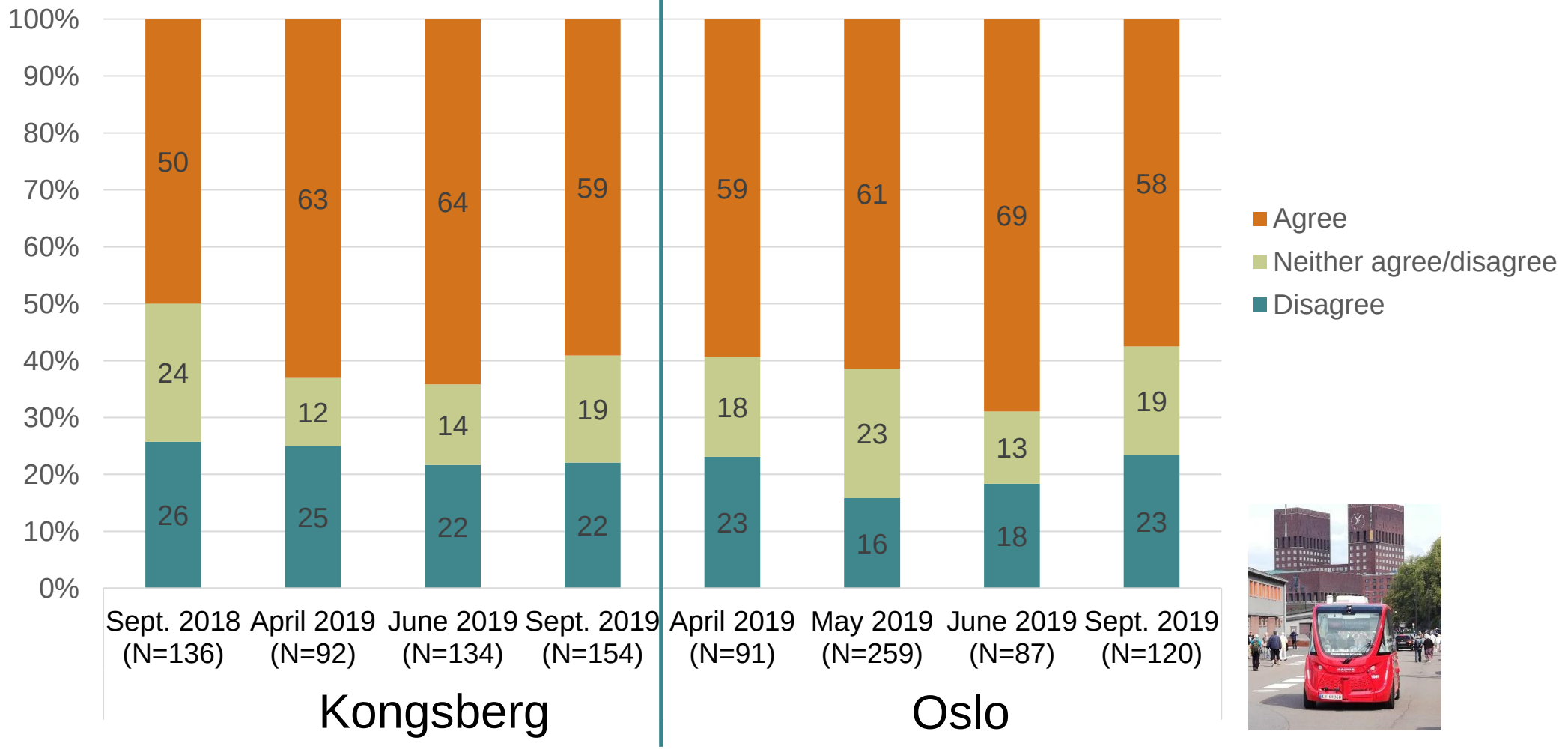
Field surveys



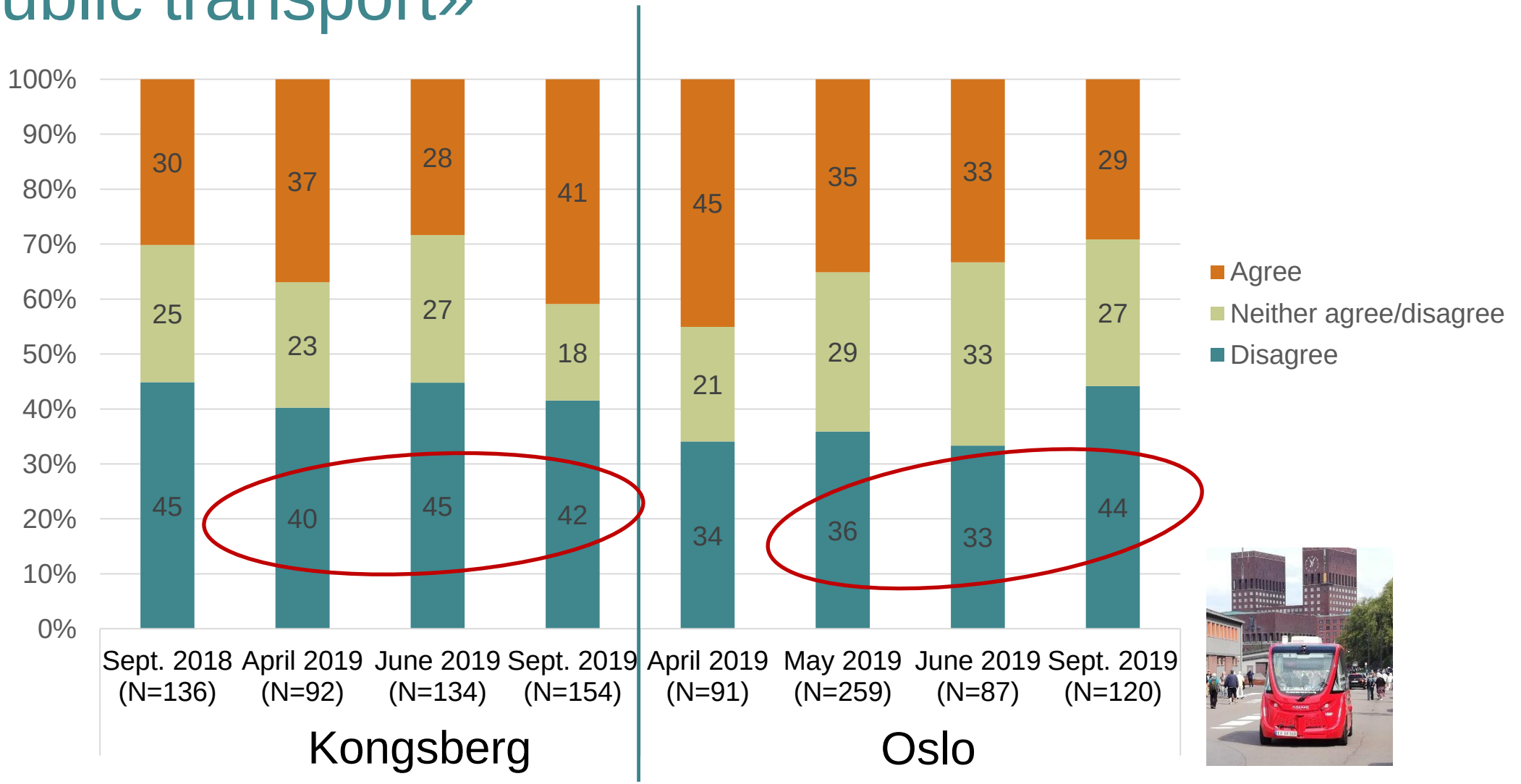
Field surveys at several points in time

- Are AV shuttles a good idea?
- Are they safe?
- How do you interact with them?

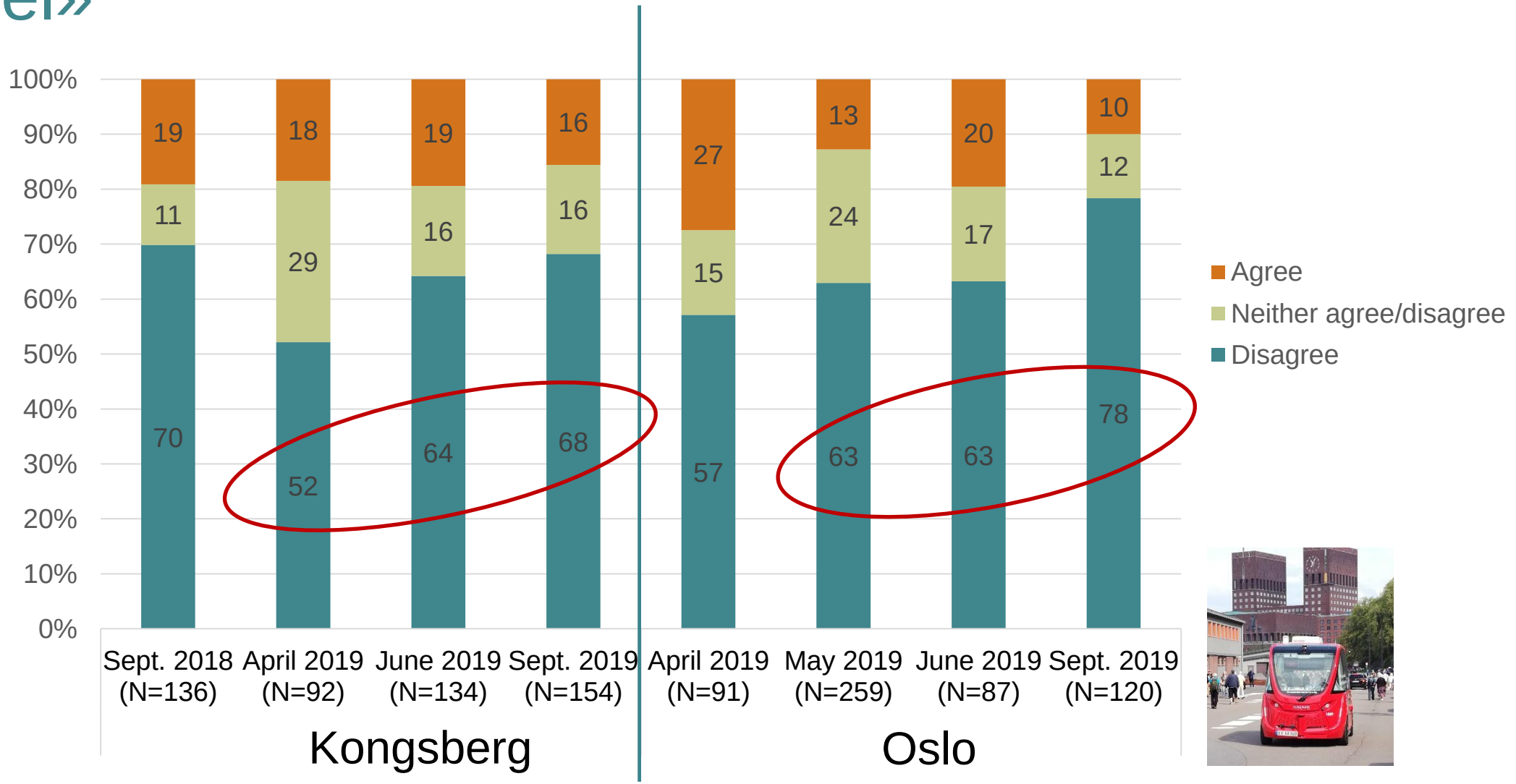
«AV shuttles will become an important part of the public transport system»



«AV shuttles will be more efficient than existing forms of public transport»

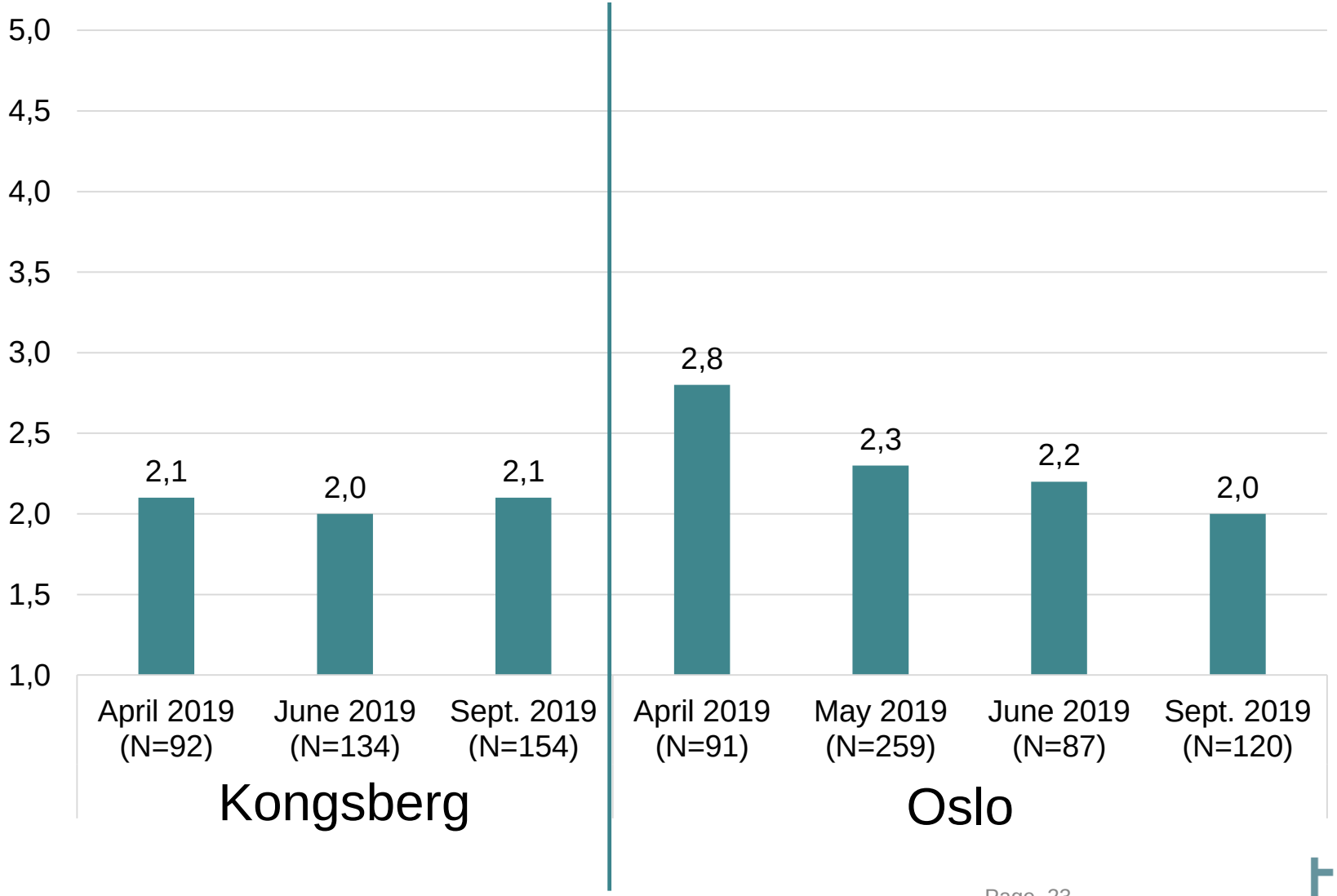


«AV shuttles will be better than my existing forms of travel»

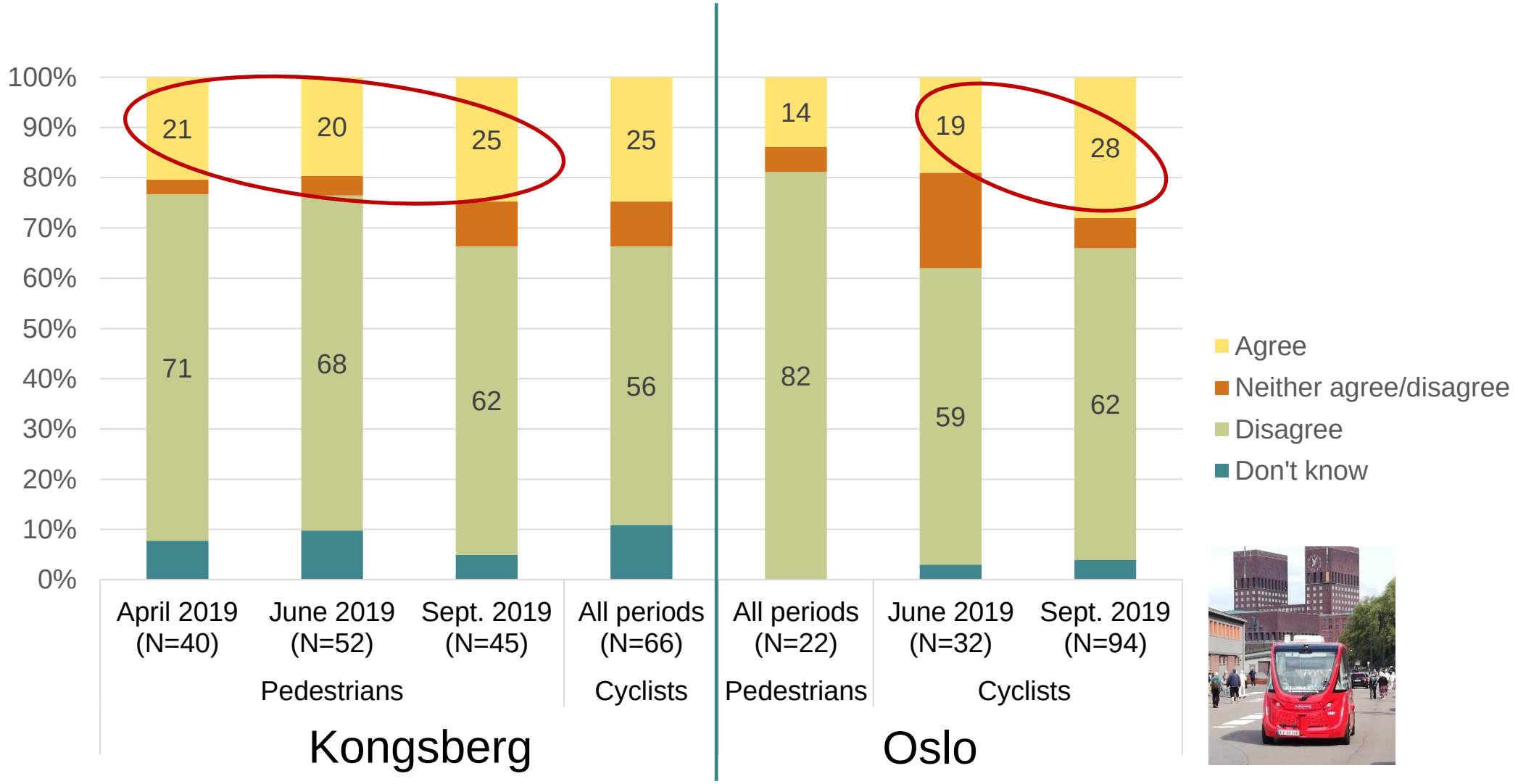


Are they safe?

On a scale from 1 to 5, where safe=1 and unsafe=5, how do you rate the AV shuttle? (Means)

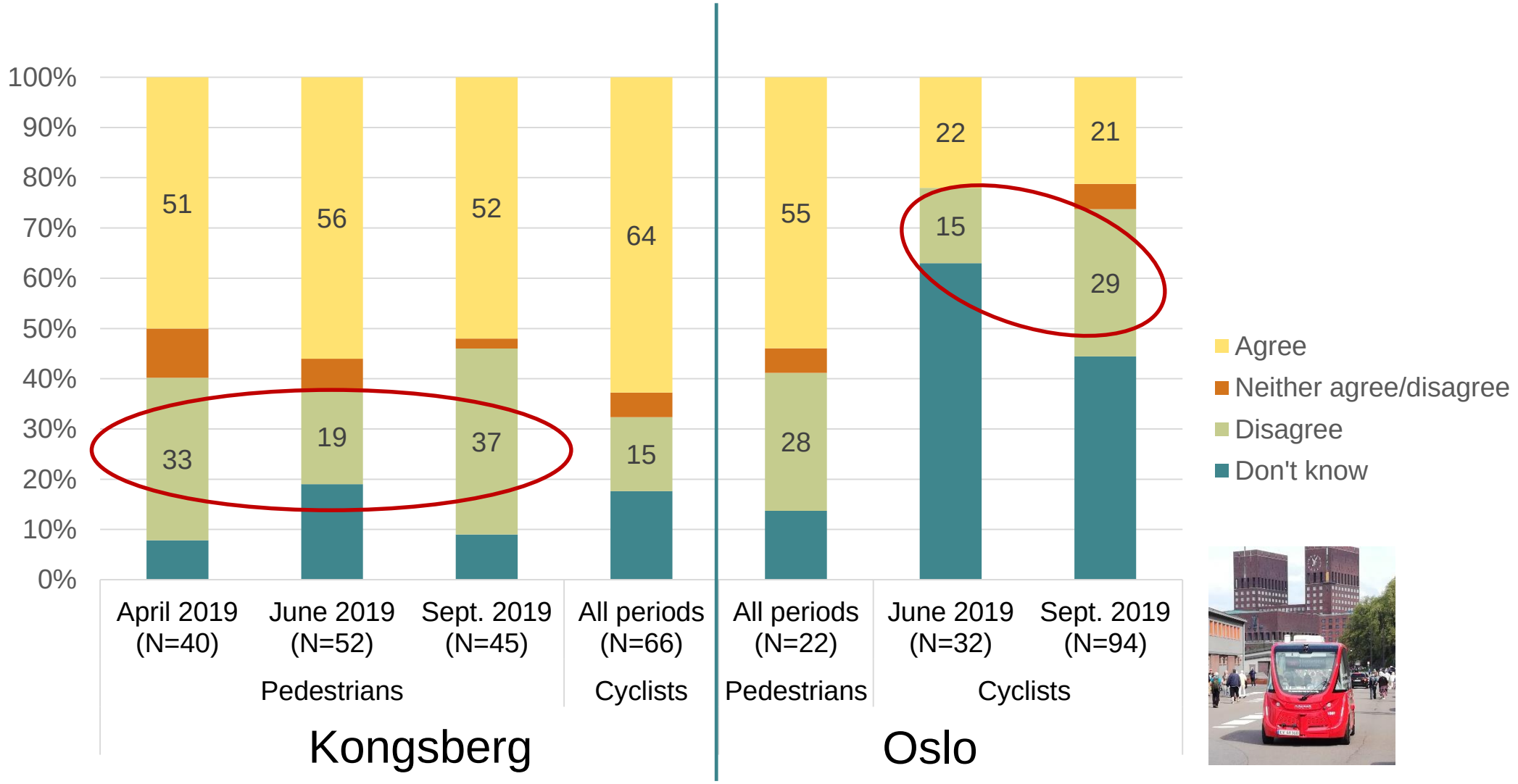


«I am not sure that the AV shuttle will stop»

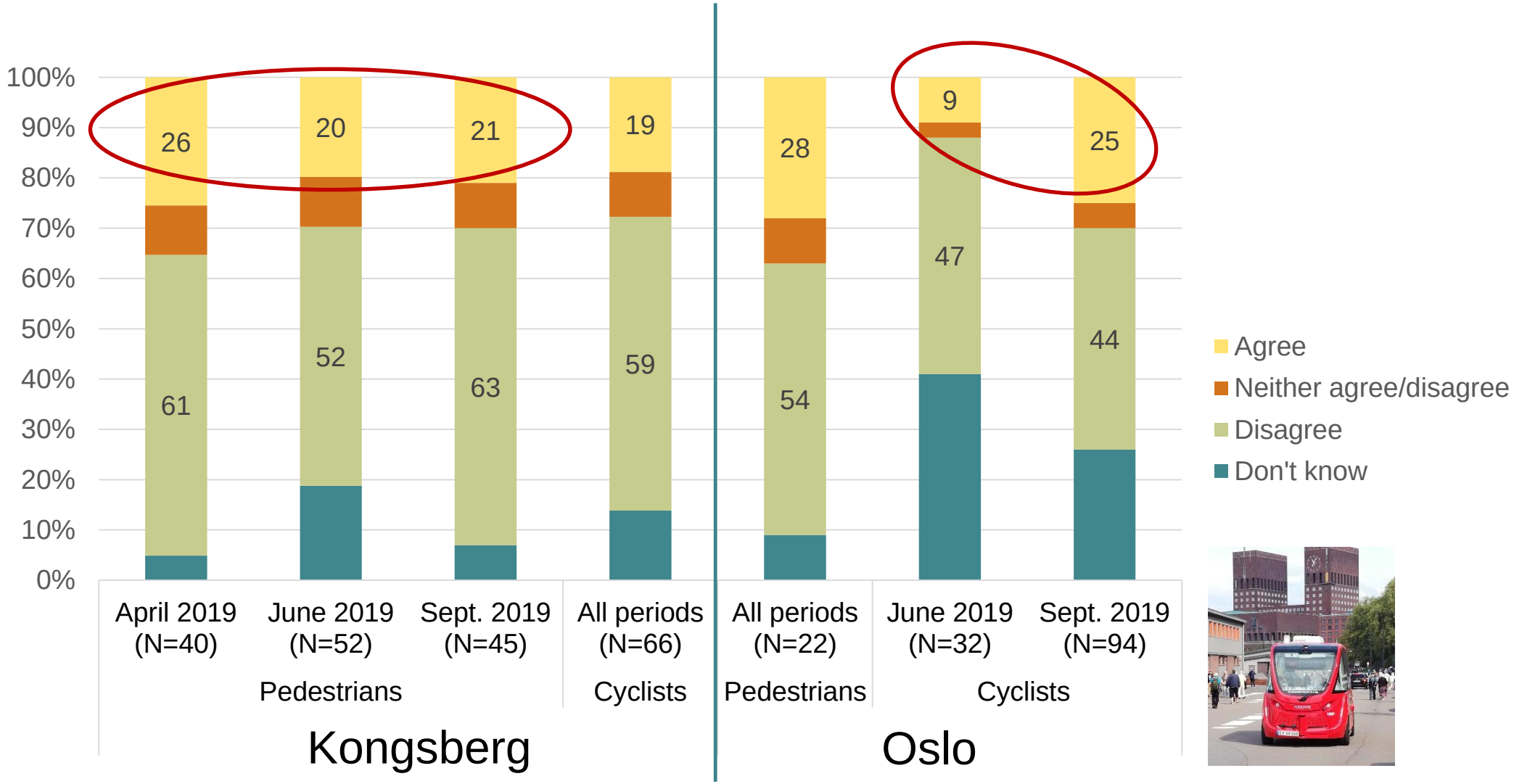


Interaction

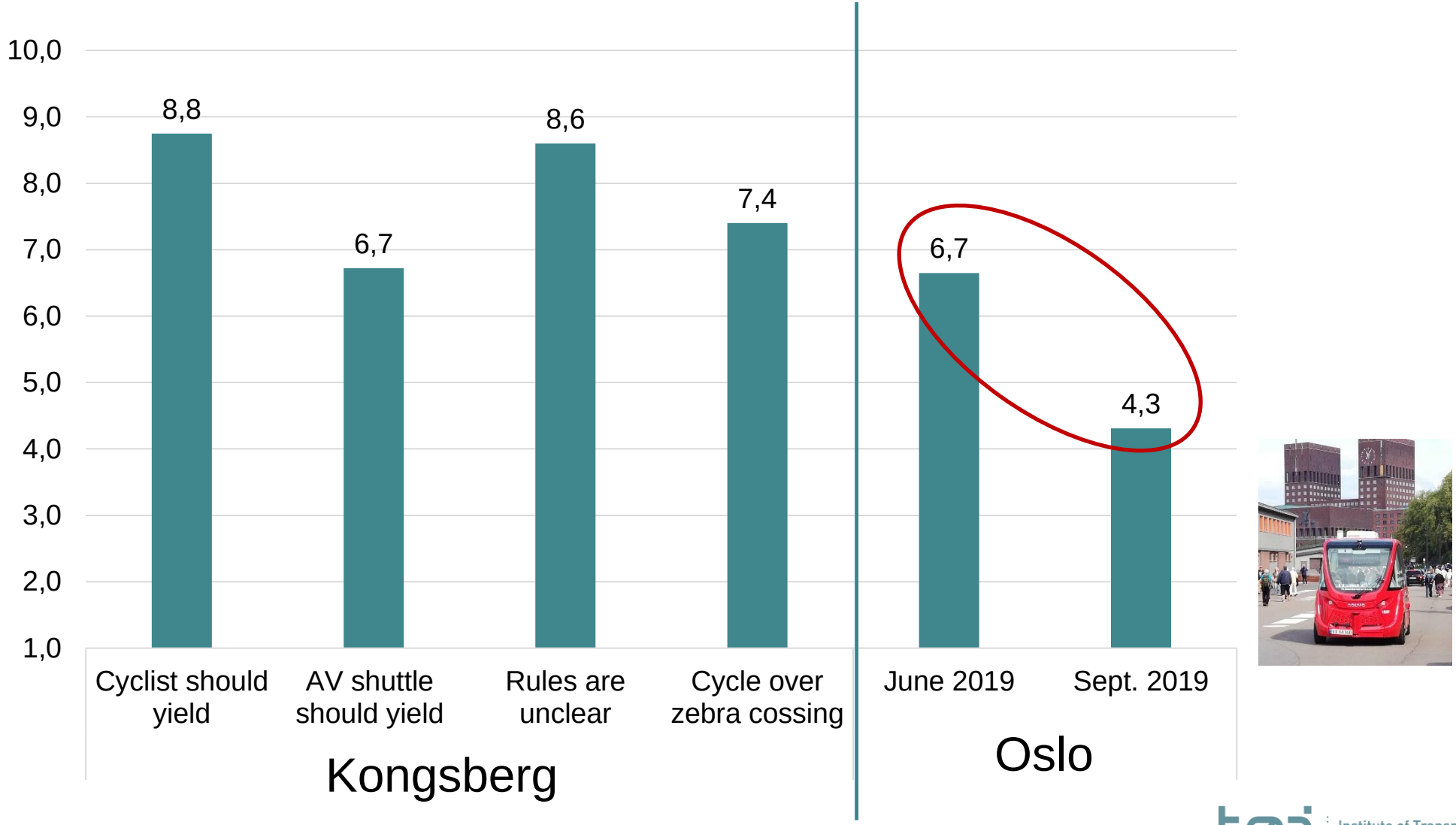
«I wait for the AV shuttle before crossing»



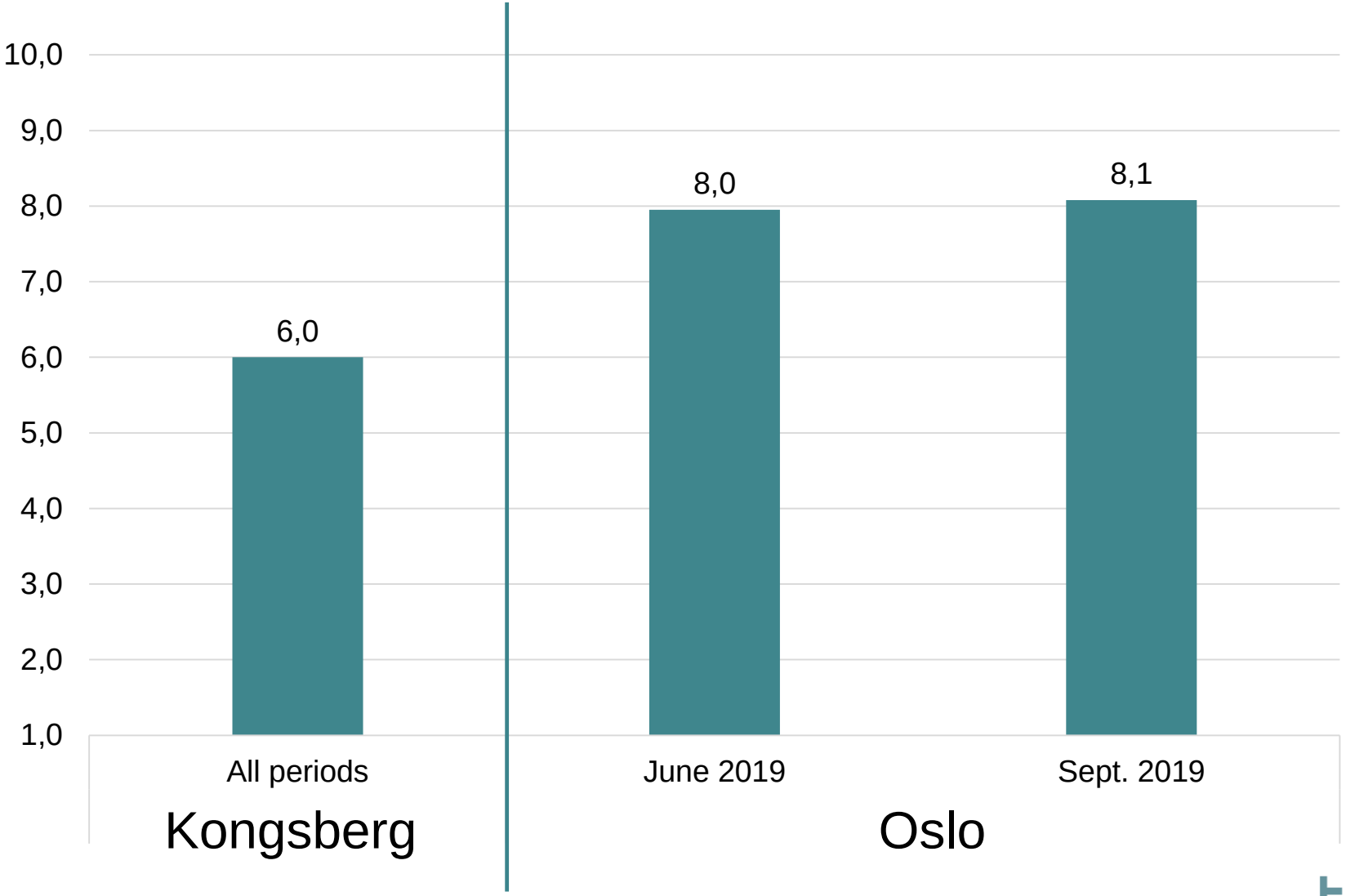
«I know the AV shuttle will stop so I cross before it»



Cyclists: On a scale from Never=1 to Always=10, how often do you yield to the AV shuttle? (Means)



Cyclists: On a scale from Never=1 to Always=10, how often do you overtake the AV shuttle? (Means)



Autobus project

Concluding remarks

- People are positive, and the AV shuttles are perceived as safe – but slow, and not always reliable.
- The AV shuttles are not as defensive/careful as expected.
- The AV shuttles are not bullied by other road users, but overtakings create obstructions, abrupt stops and risky situations.
- Obstructions by other road users are not increasing, but cyclists in Oslo say they have become more assertive towards the AV shuttle over time.
- Public transport agencies and companies are scaling up autonomous public transport with more «normal» driving behaviour and MaaS ambitions.