



Ministry of Infrastructure and the
Environment

KiM | Netherlands Institute for Transport Policy
Analysis

Paths to a self-driving future

Five transition steps identified

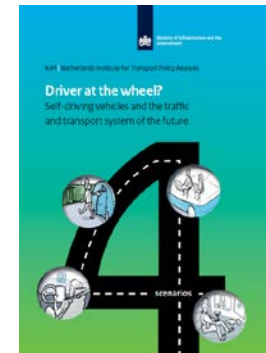
Dr.ir. Taede Tillema

IJDS Symposium
Haarlem, 14 June 2017

Research programme

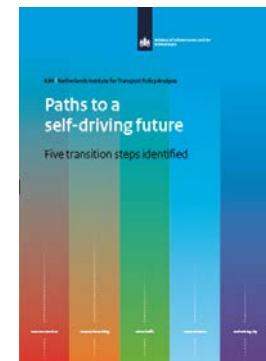
1. Driver at the wheel?

- Four scenarios for a future traffic and transport system with automated vehicles



2. Paths to a self-driving future

- Transition paths towards the scenarios
- Perspective on policy options

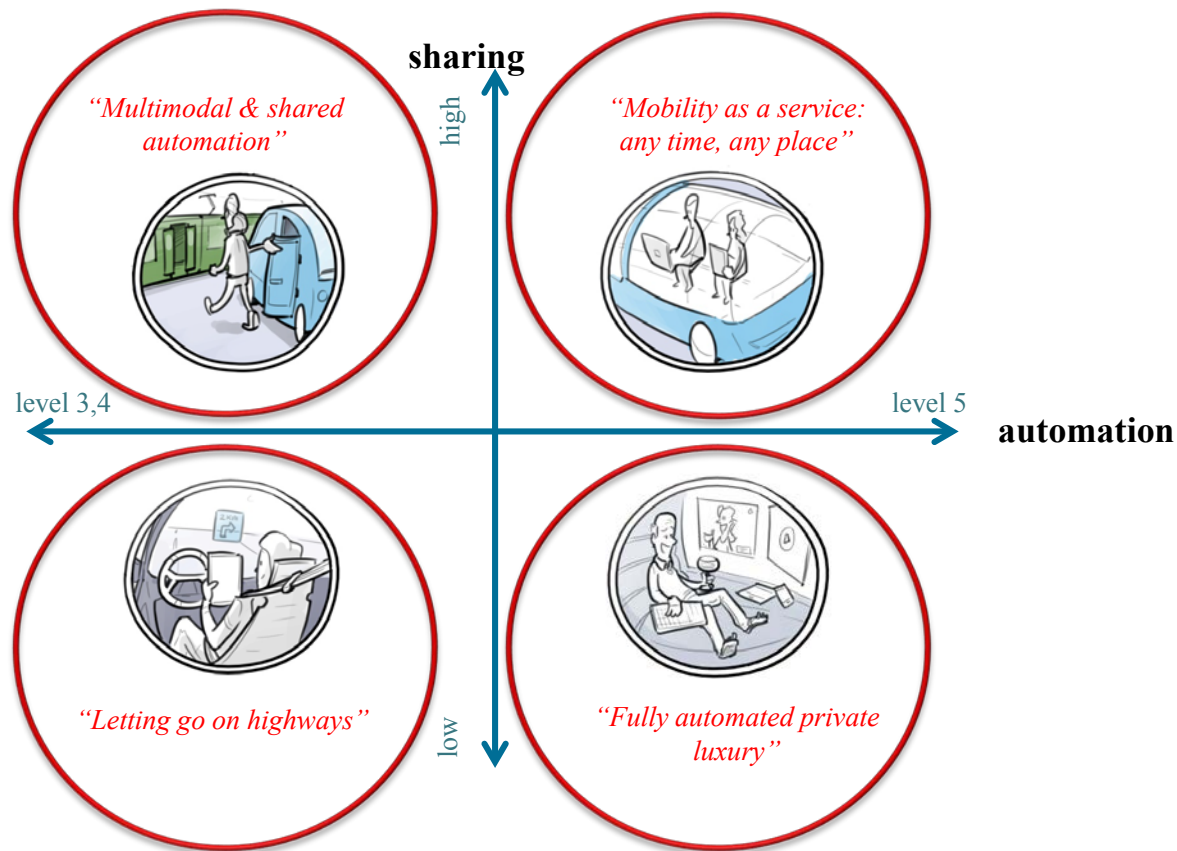




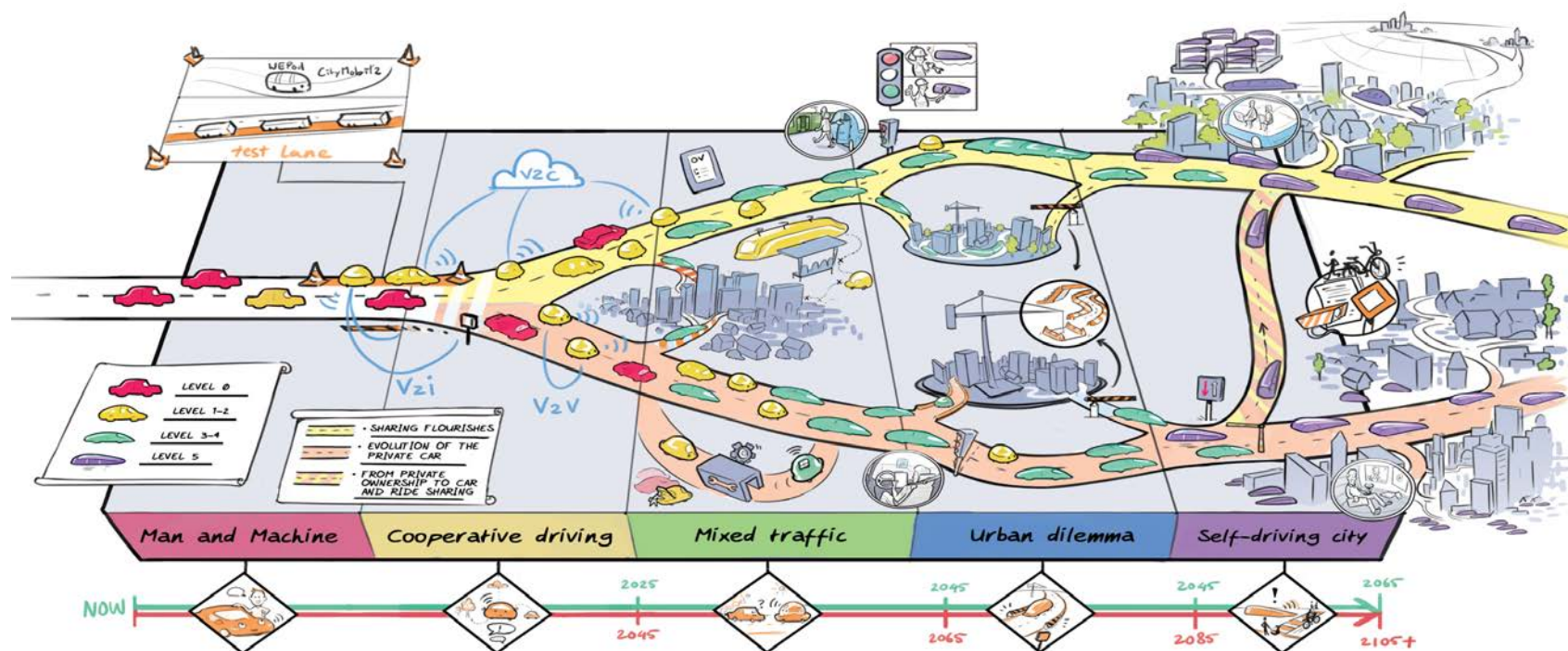
Definition: SAE-levels of automation

Level	Name	Example
<i>Human driver monitors the driving environment</i>		
0	No automation	Lane Departure Warning
1	Driver assistance	Adaptive Cruise Control
2	Partial automation	Parking Assistance
<i>Automated driving system monitors the driving environment</i>		
3	Conditional automation	Highway Chauffeur
4	High automation	Parking Garage Pilot
5	Full automation	Robot Taxi

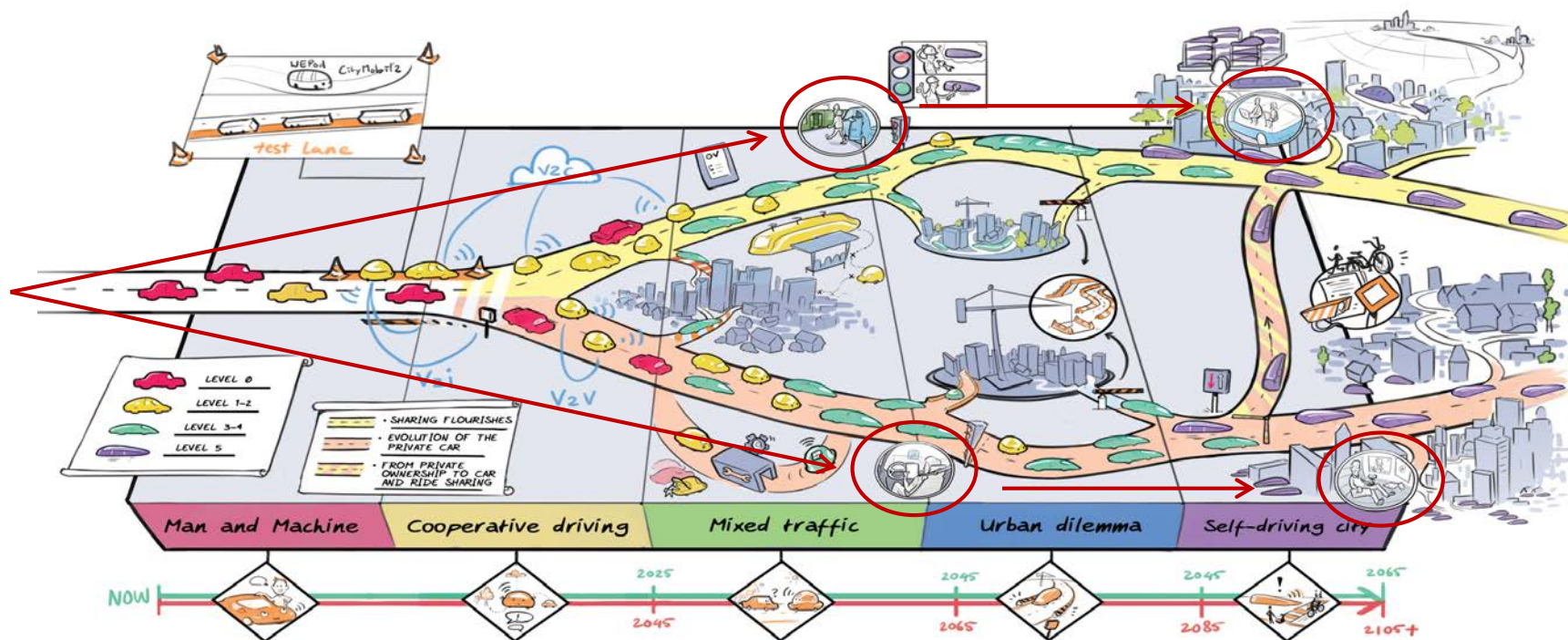
Driver at the wheel? Uncertainties and scenarios



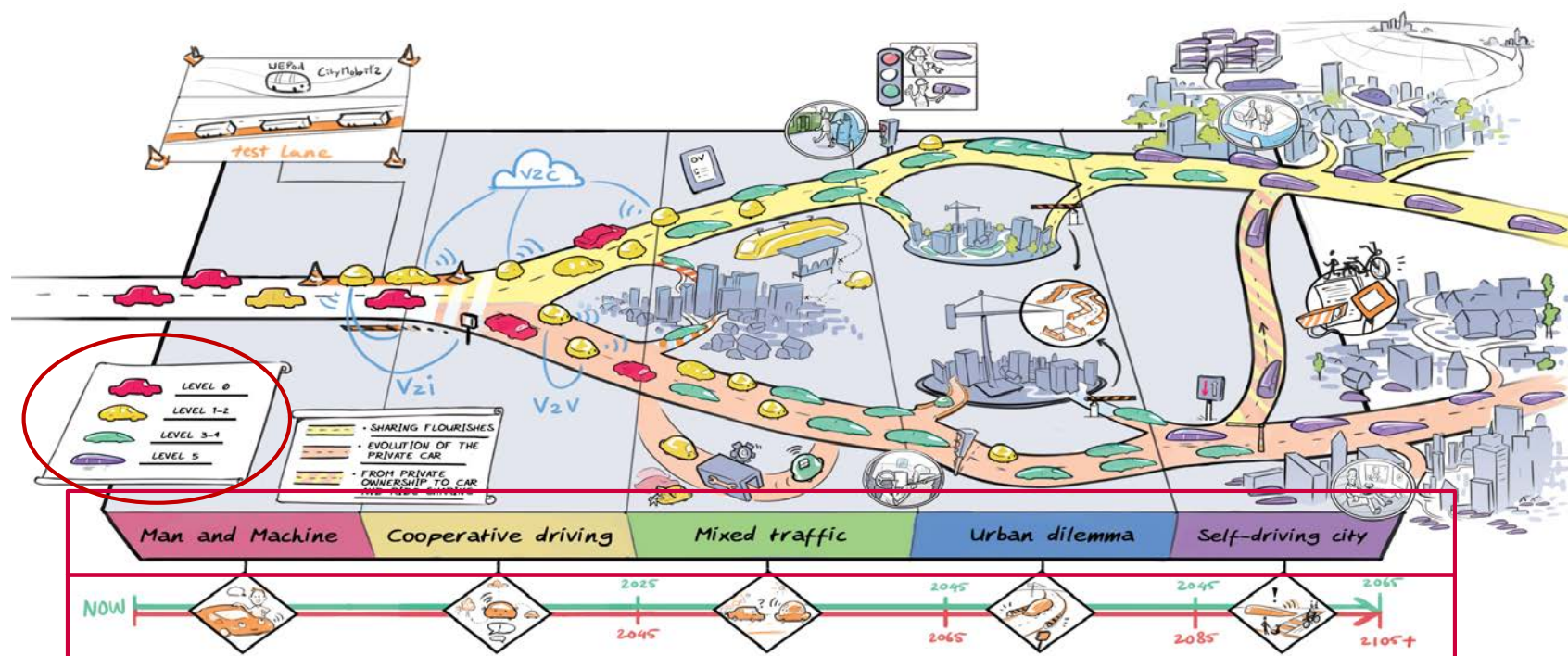
Transition paths: the story line



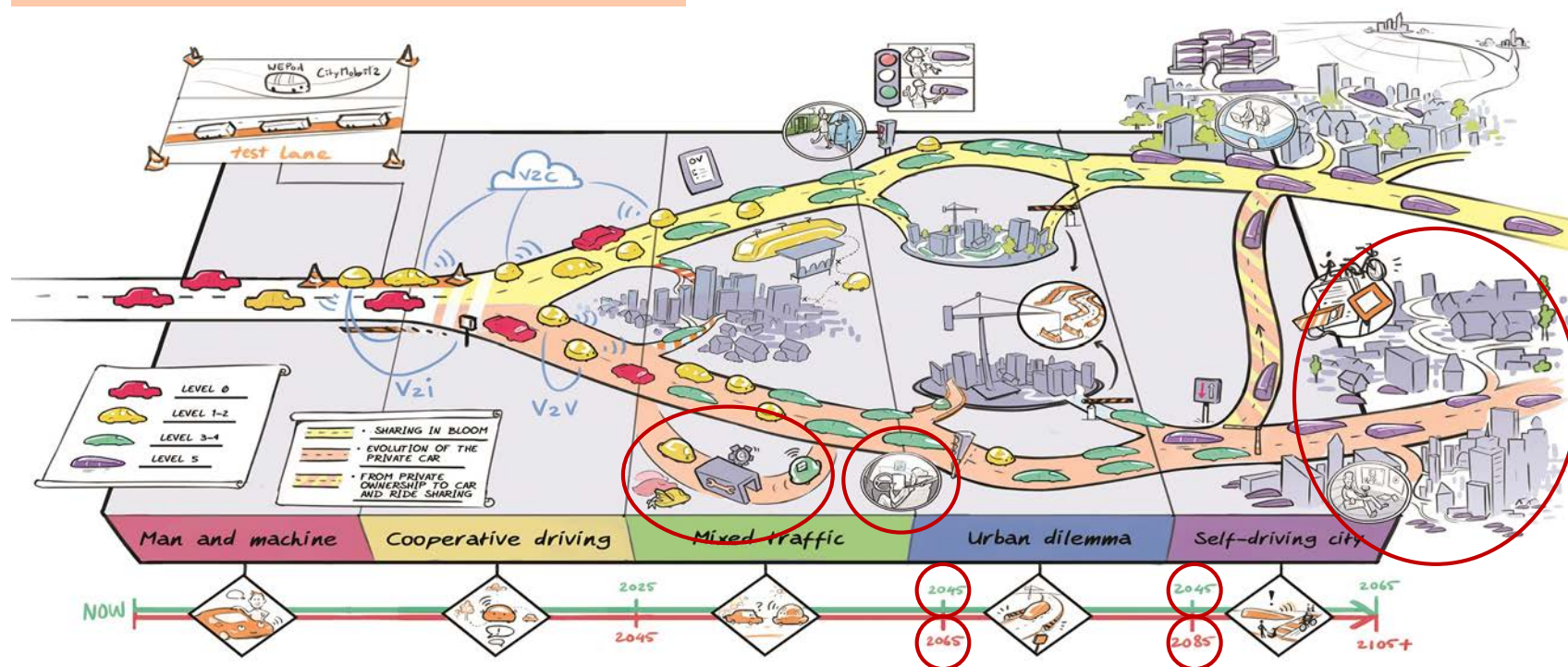
Two paths towards the scenario worlds



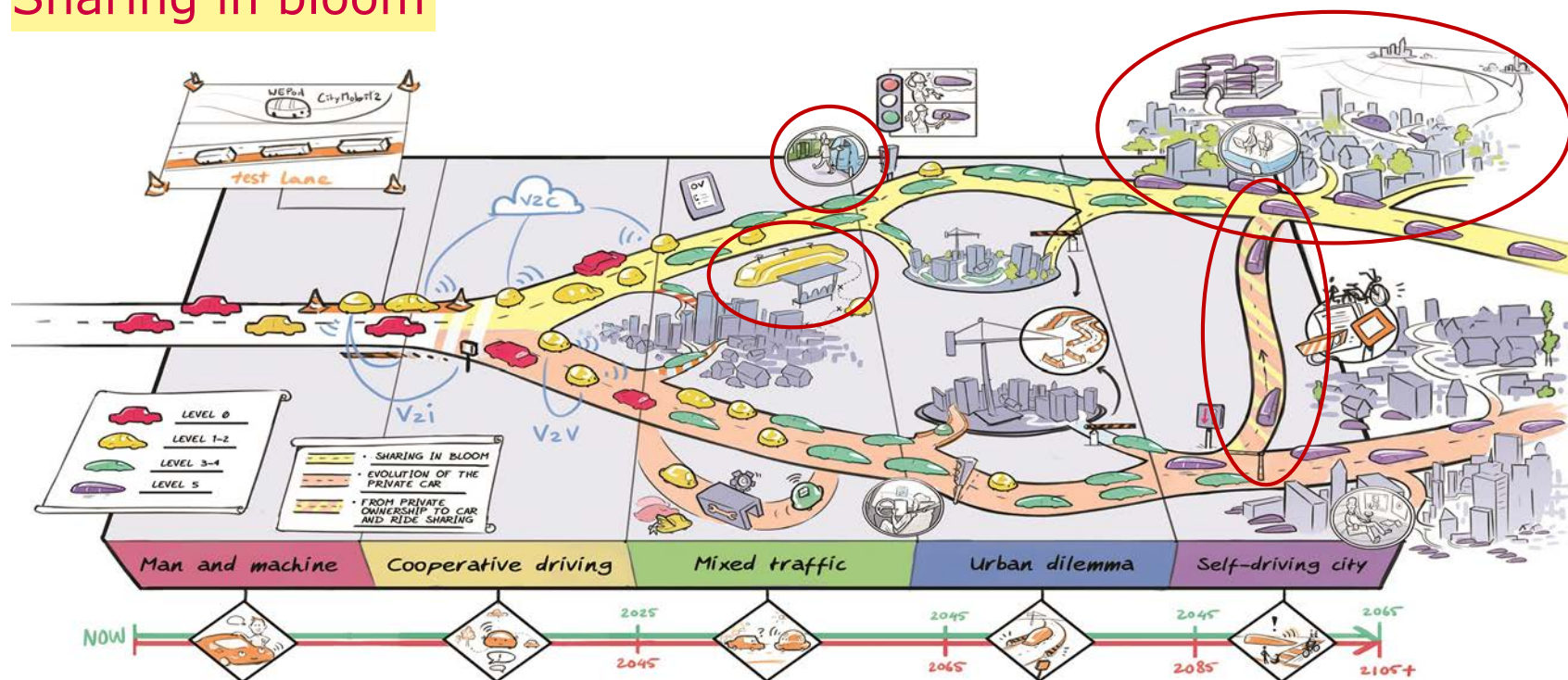
Evolving cars, transition steps and a time line



Evolution of the private car

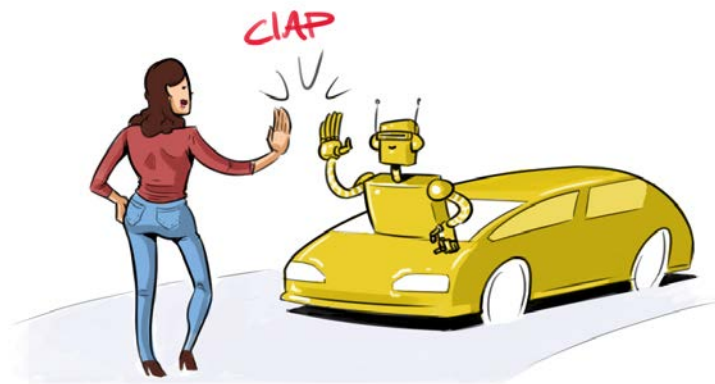


Sharing in bloom



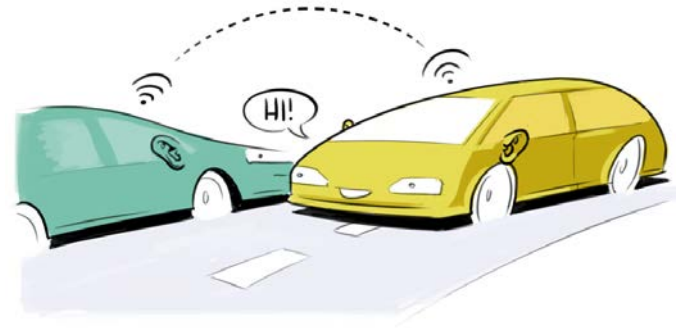
Man and machine (I 1/2)

- Best of two worlds?
 - human beings excel in complex unexpected circumstances
 - technology supports driver
 - higher traffic safety
 - improved traffic flow
- Or not?
 - driver loses attention: accidents
 - trust in technology undermined



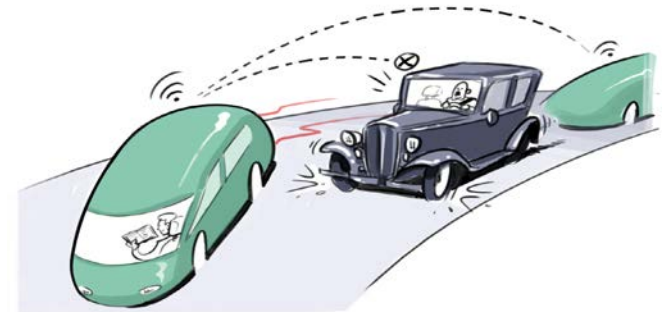
Cooperative driving (I 1/2)

- Holy grail?
 - Efficient road use
 - Higher traffic safety
 - Less congestion
 - Less CO₂
- Or bridge too far?
 - Sensor and software reliability
 - Cyber security: hacks, privacy



Mixed traffic (I 3/4)

- Solves itself?
 - consumers appreciate safer traffic and efficient road use
 - investments in transition zones between highway and city
- Or showstopper?
 - consumer prefers to be in control
 - dangerous interaction



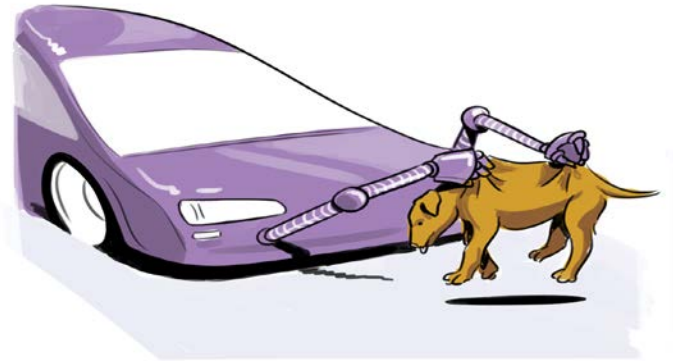
Urban dilemma (I 3/4)

- Separate modes?
 - I5 technology far away
 - Adjust city infrastructure
 - I 3/4 lanes
- Or driver in control?
 - I5 technology nearby
 - Separate modes too costly



Self driving city (I 5)

- Contested space?
 - bikers and pedestrians take the road
 - car traffic comes to a standstill
- Or flexible interaction?
 - physical separation
 - technology
 - 'pushy' automated vehicle
 - culture



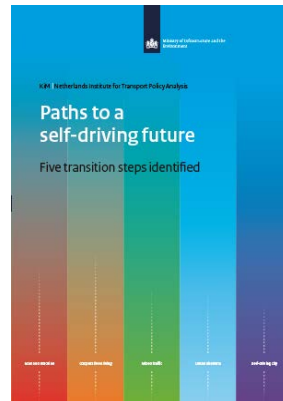
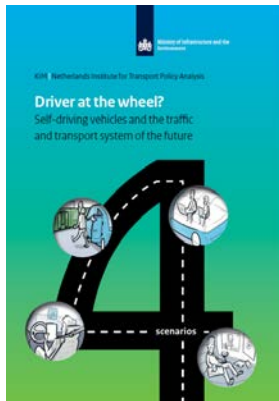


Main conclusions

- On the long run automated vehicles yield many positive effects for society
- Highways and cities filled with fully automated vehicles are still rather far away
 - Yet, first steps are already being taken
- Transition is crucial and determines how the future will look like
 - Implications for society differ considerably in the two transition paths
- Transition consists of five major steps:
 - man and machine, cooperative driving, mixed traffic, urban dilemma, self-driving city
- Transition in each step may progress smoothly or bumpy
- In each step adaptive policy is key



Thank you for your attention!



english.kimnet.nl