



Future  
Mobility  
Network

# Virtual Reality Experiment

Human  
Factors

- Visit of Welly
- 360° recordings with a dedicated camera
- VR glasses



19-04-18

The Autonomous Future

Nunez Velasco et al (in prep)

TU Delft

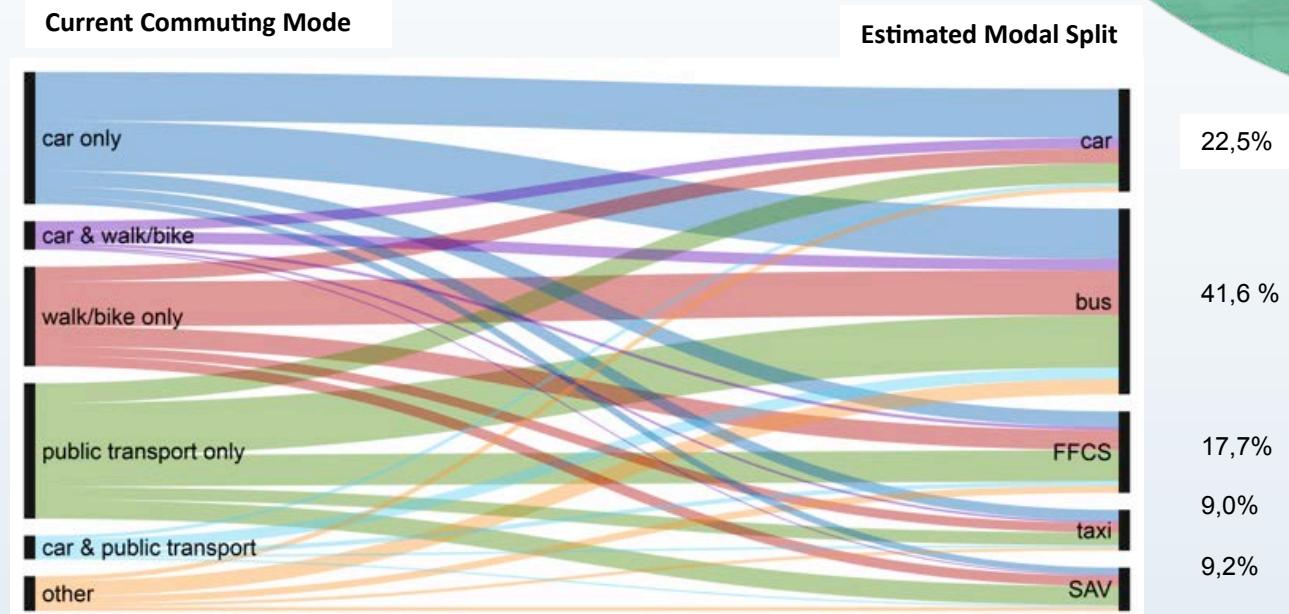




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# Modal shift?

840 respondents  
Amsterdam, Utrecht, The  
Hague Rotterdam



Winter et al (2017), Mode Preferences in Times of Free-Floating Carsharing and Shared  
Automated Vehicles - a Stated Choice Experiment, submitted.



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# When will automated cars be available?

Level	Name	Narrative definition	DDT		DDT fallback	ODD
			Sustained lateral and longitudinal vehicle motion control	OEDR		
<i>Driver performs part or all of the DDT</i>						
0	No Driving Automation	The performance by the driver of the entire DDT, even when enhanced by active safety systems.	Driver	Driver	Driver	n/a
1	Driver Assistance	The sustained and ODD-specific execution by a driving automation system of either the lateral or the longitudinal vehicle motion control subtask of the DDT (but not both simultaneously) with the expectation that the driver performs the remainder of the DDT.	Driver and System	Driver	Driver	Limited
2	Partial Driving Automation	The sustained and ODD-specific execution by a driving automation system of both the lateral and longitudinal vehicle motion control subtasks of the DDT with the expectation that the driver completes the OEDR subtask and supervises the driving automation system.	System	Driver	Driver	Limited
<i>ADS ("System") performs the entire DDT (while engaged)</i>						
3	Conditional Driving Automation	The sustained and ODD-specific performance by an ADS of the entire DDT with the expectation that the DDT fallback-ready user is receptive to ADS-issued requests to intervene, as well as to DDT performance-relevant system failures in other vehicle systems, and will respond appropriately.	System	System	Fallback-ready user (becomes the driver during fallback)	Limited
4	High Driving Automation	The sustained and ODD-specific performance by an ADS of the entire DDT and DDT fallback without any expectation that a user will respond to a request to intervene.	System	System	System	Limited
5	Full Driving Automation	The sustained and unconditional (i.e., not ODD-specific) performance by an ADS of the entire DDT and DDT fallback without any expectation that a user will respond to a request to intervene.	System	System	System	Unlimited

## The leading automation definition

SAEJ3016 - Sept 2016

ADS automated driving system

DDT dynamic driving task

OEDR object and event detection and response

ODD operational design domain



NOW



2020



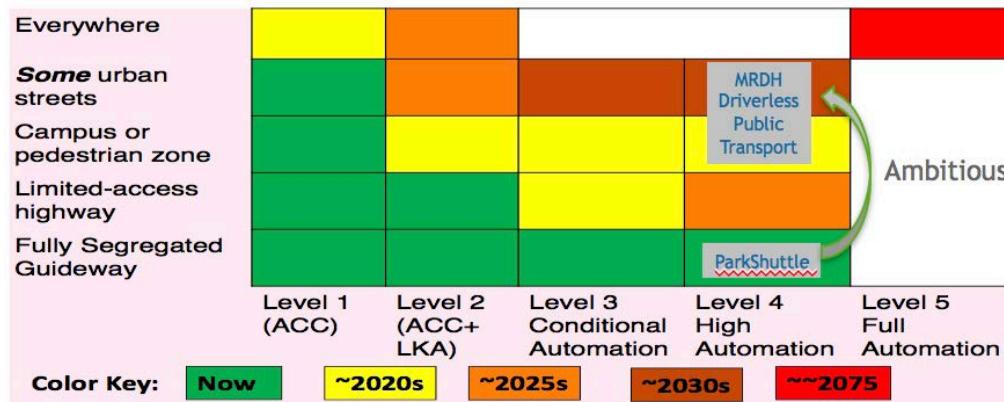
Driverless



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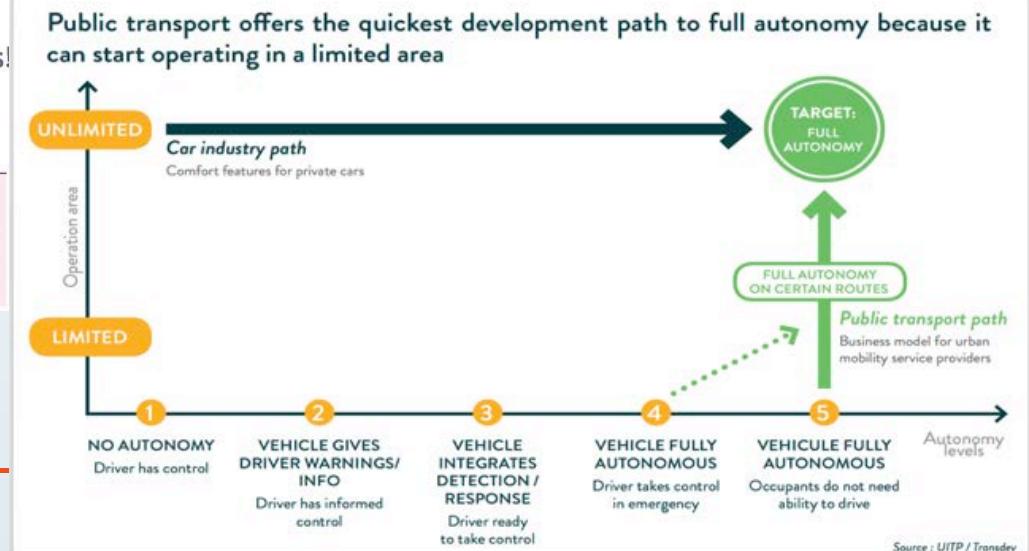
# When will automated cars be available?

**Time-table**  
[Opinions collected at AUVSI 2016]



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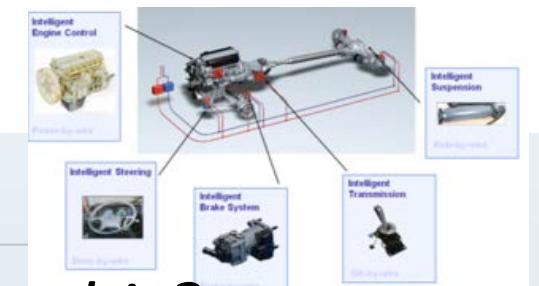
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# Technical challenges

- Routing
- Detecting
- Interpreting
- Reacting
- Actuation



Implementation



*What can a company/start-up contribute to this?*



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# Development routes



Anti-lock Braking System



Implementation

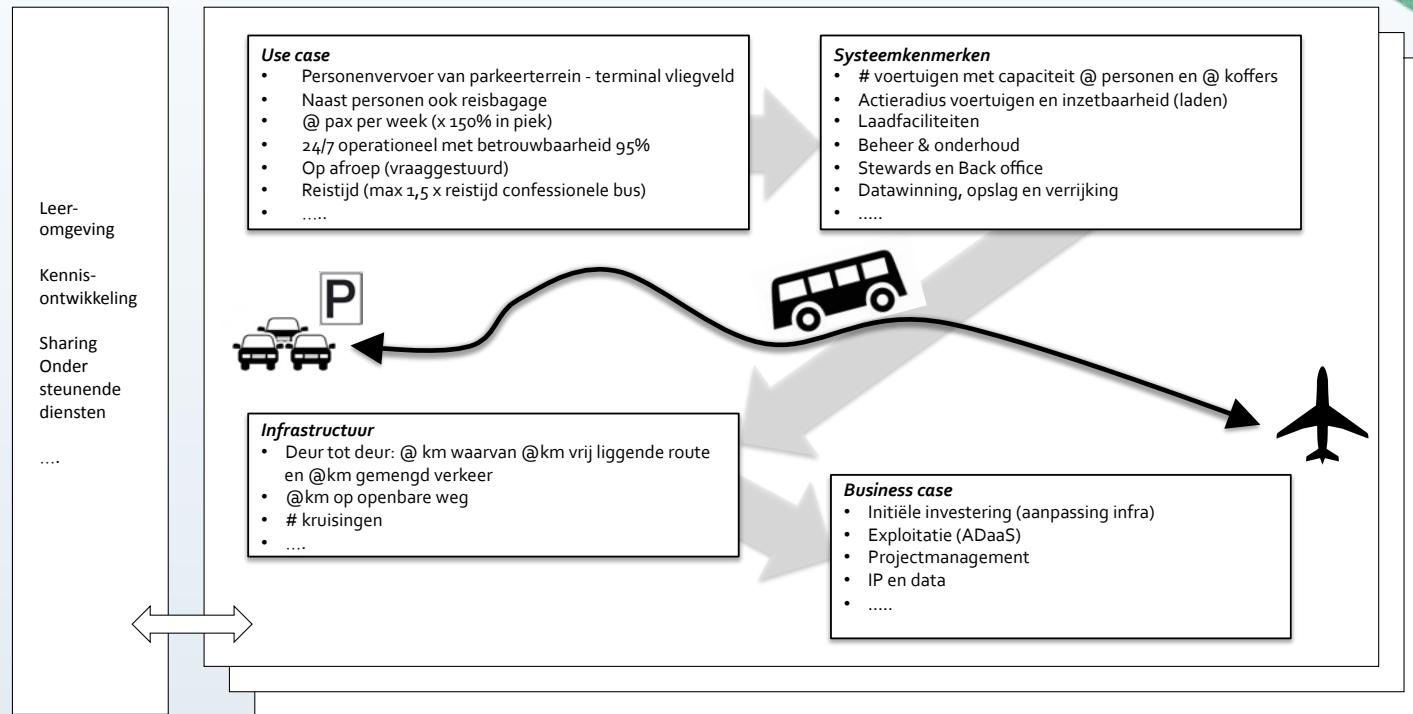
- Driving assistance → AV's
- Rail vehicles → Automatic shuttles

Convergence





# Implementation

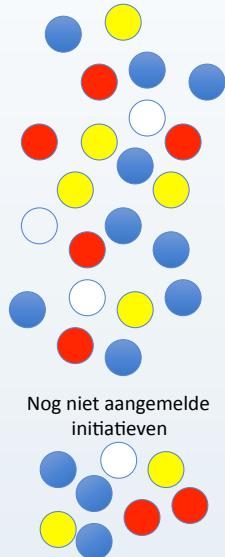




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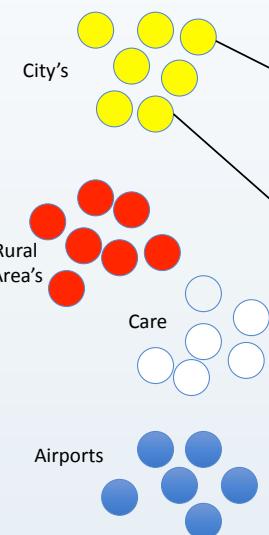
# Versnelling: voorstel voor aanpak

Approval Requests

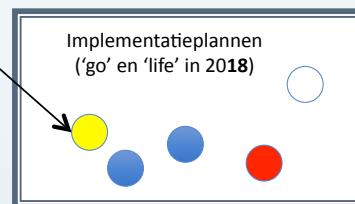
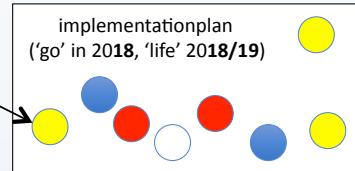


Screening / functionele clustering naar PMC's

Product Market combinations  
CAV



Van long list naar short list (2018)



Targets  
(3-5 jaar)

25-50 vehicles  
(shuttles)

25-50 vehicles  
(shuttle/robottaxi)

50 - 100 voertuigen



Road Readiness (RDW test-week)

Market scan (capacity, speed etc)

Conditions (regulations etc)

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# The Autonomous Future

A realistic perspective

Thank you!

For more information: [www.thefuturemobility.network](http://www.thefuturemobility.network)

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Alwin Bakker

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