Impacts of automated driving

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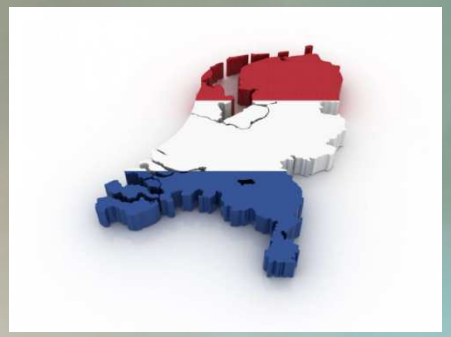
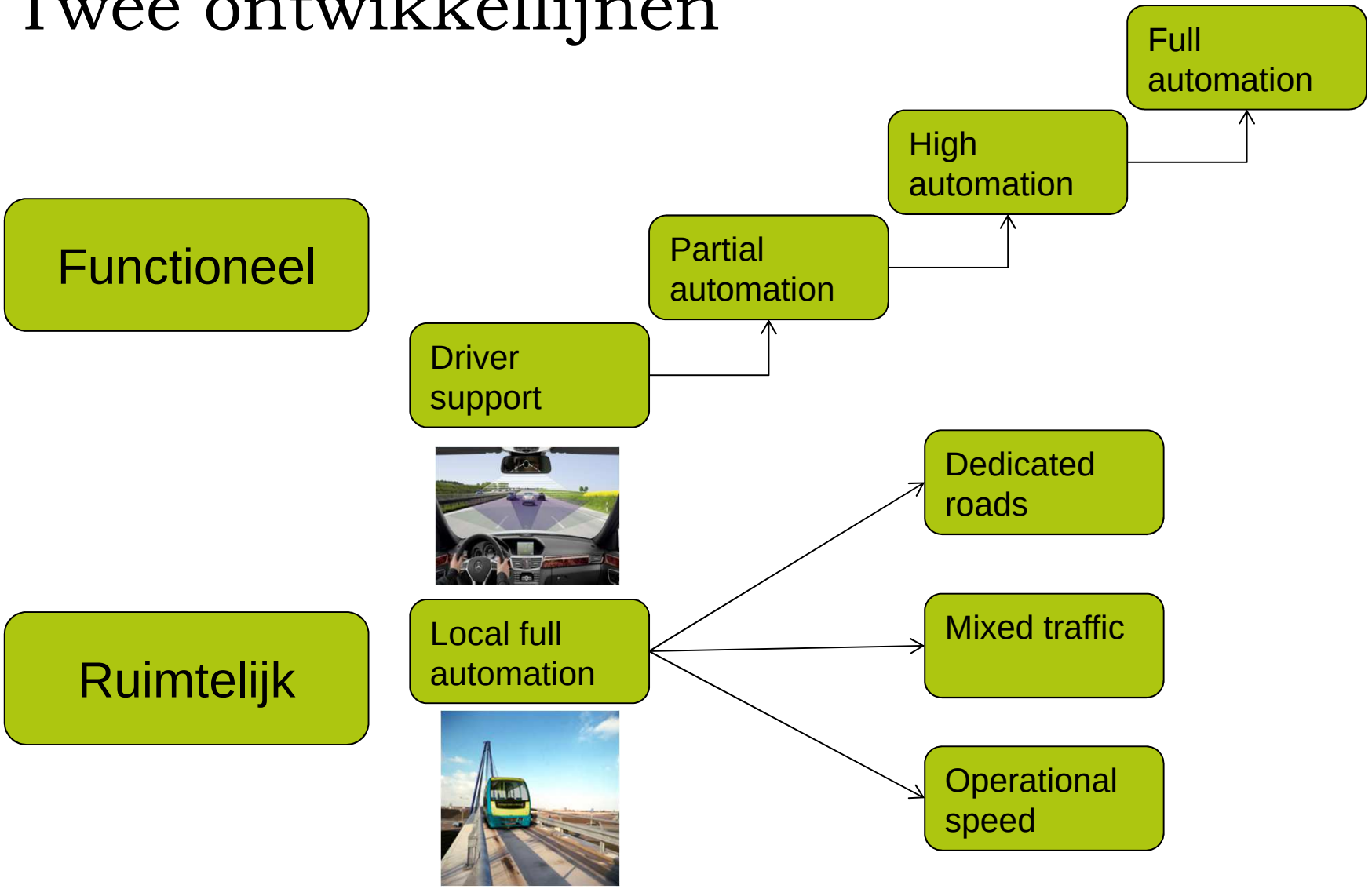


Impact of Automated driving

- Infrastructuur
- Digital infrastructuur
- Verkeersafwikkeling
- Mobiliteit en ruimte
- Veiligheid
- …

Twee ontwikkellijnen



Wat is automatisch rijden?

Partial automation

Available,
Mercedes S class
Limited scope

High automation

Massive worldwide R&D

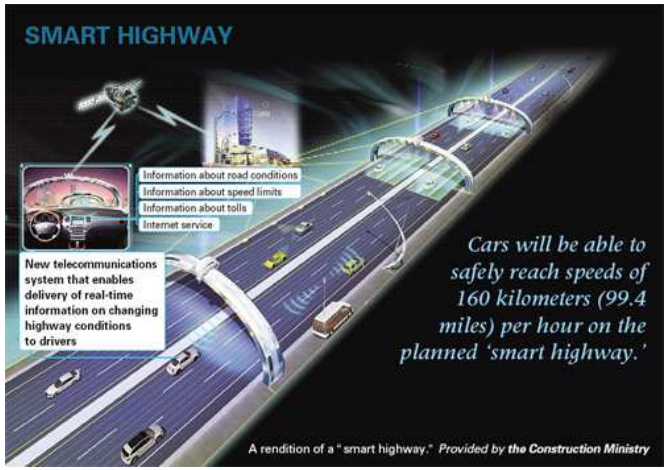
Likely before 2025

Full automation

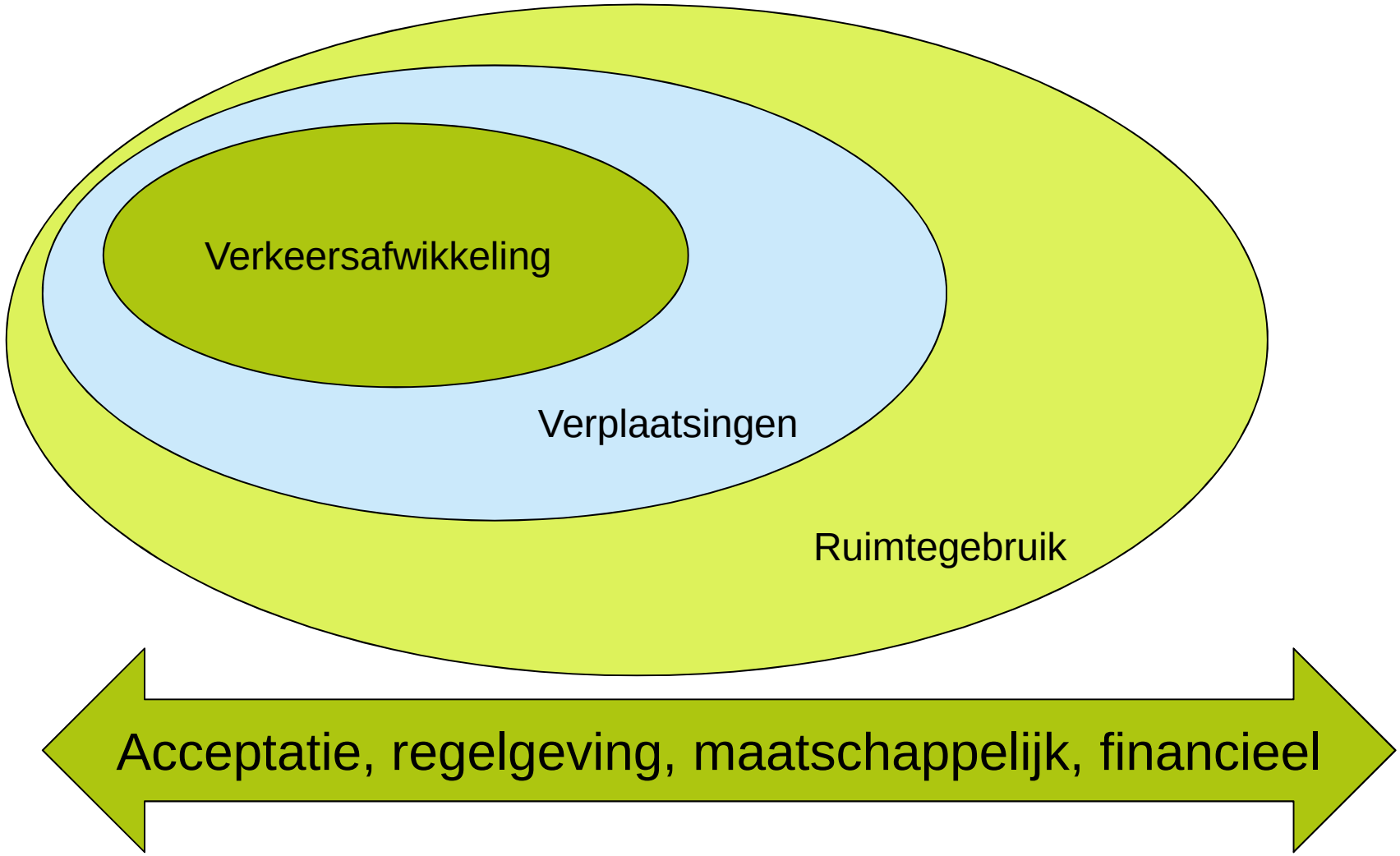
Decades away unless on dedicated infrastructure or driving very slowly

Effect op infrastructuur

Markering
Slijtage
Bochten
Vluchtstroken
Versmalde rijstroken
Kruisingen, rotondes
Shared space



Drie aangrijpingspunten

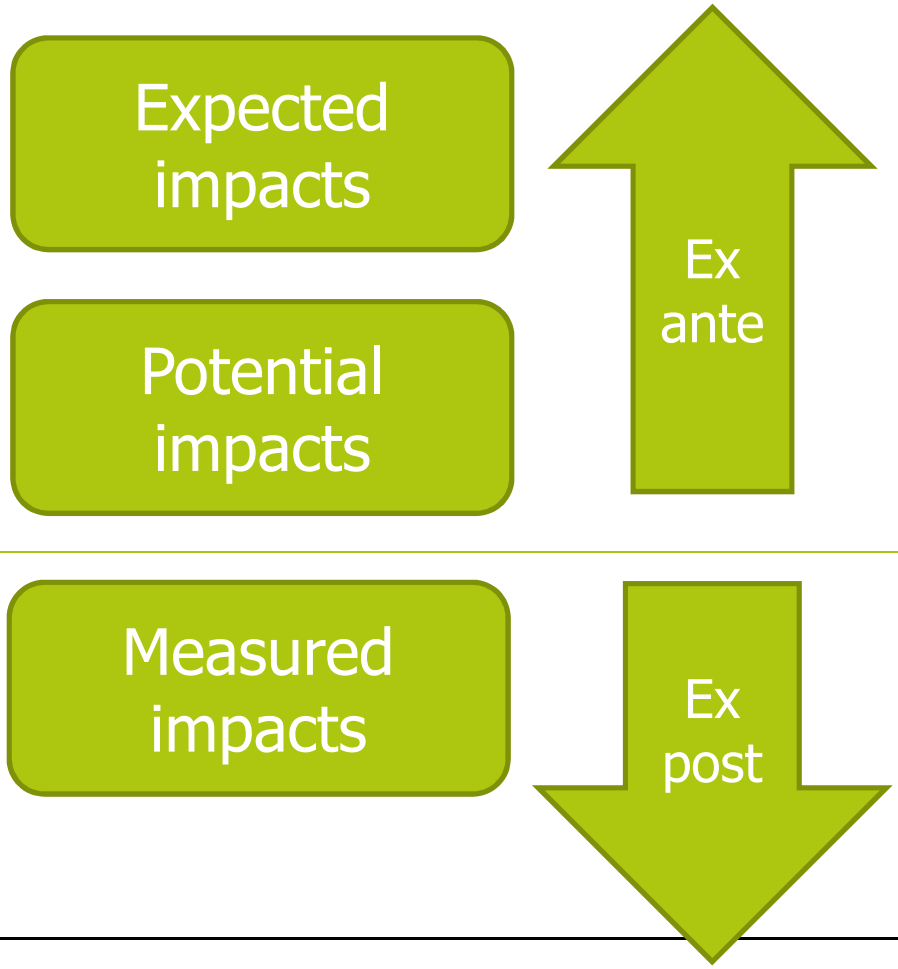


Impact types

Conceptual, strategic, statistics, 1st order, expert judgement

System specification, realistic, modelling, simulation, pilots 2nd order.

Large scale deployment Detailed statistics

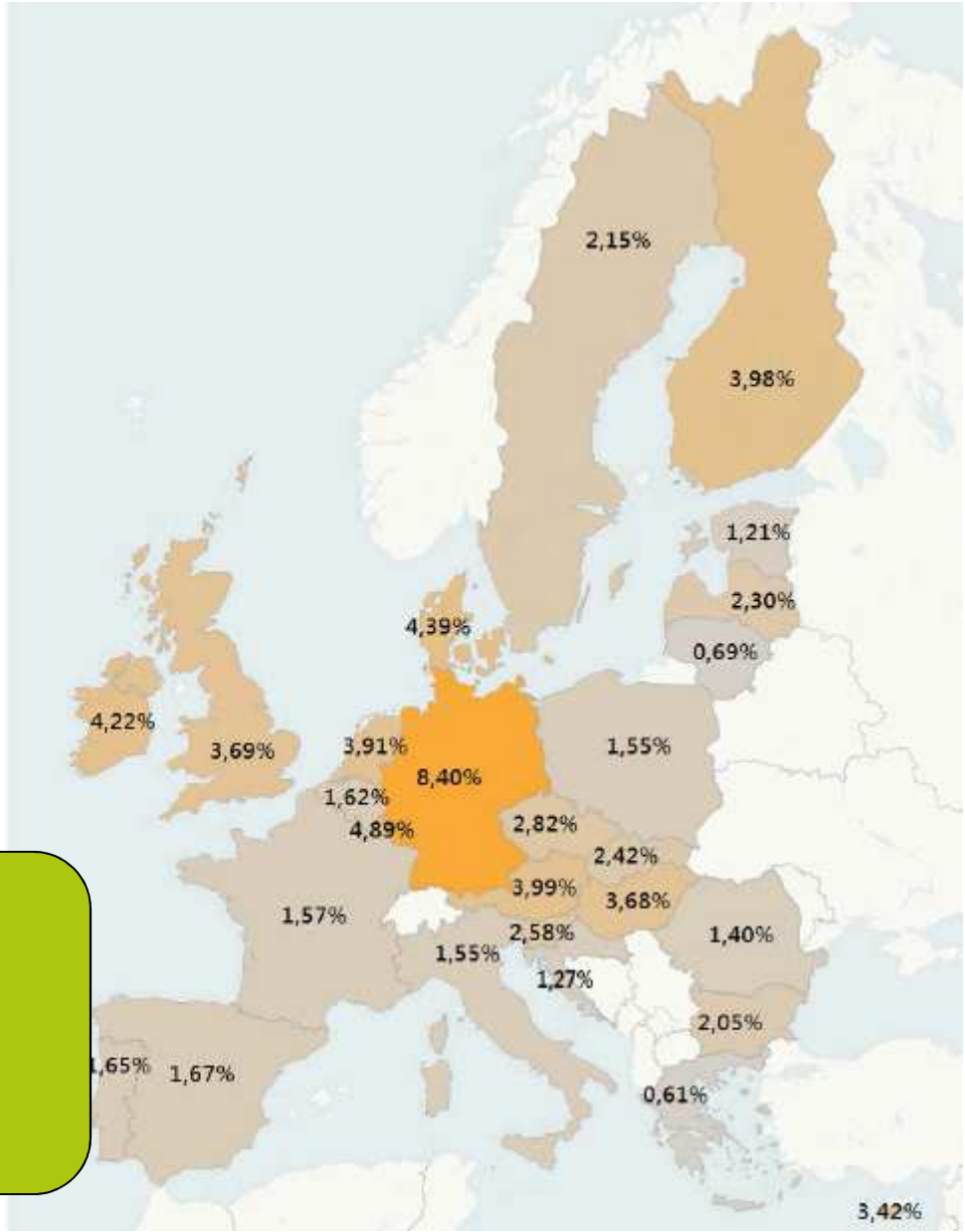


DEPLOYMENT RATES - EU27
BY MEMBER STATE

PS3
OBSTACLE & COLLISION WARNING

2012

PASSENGER CARS NEW REG. IN 2012



NL: tendens kleine auto's PHEV bv Volvo V60 in buitenland doorverkocht?

Consumers Interested in Autonomous Driving

24% Overall Interest

Who's interested in autonomous driving? (continued)

Interest by Age

Generation Y

41%

2025

$74.4k

25%

$98.8k

Generation X

Later Boomers

13%

$107.5k

13%

$98.5k

Early Boomers

Source: J.D. Power 2014 U.S. Emerging Technologies Study

What does the consumer think autonomous driving is?

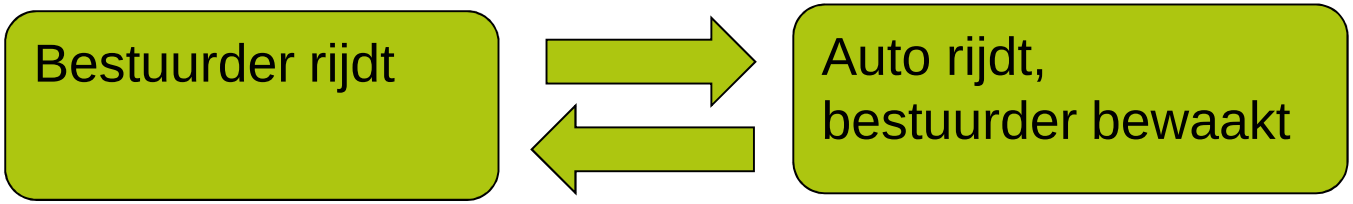
Engaged and ready to assume control

Completely detached from the drive experience

In the command position in case they are called upon

Possibly not even in the vehicle at times

Fundamentele verandering in gedrag



Werklast, rijprestatie, aandacht, risicocompensatie, Driver Vehicle Interface, acceptatie, adaptiviteit, overgangen, aanschaf en gebruik

Werklast daalt, aandacht verslapt. Inzicht in daadwerkelijk gebruik, condities, transities ontbreekt.

Verkeerskundig

Solve traffic jams by increased outflow

Prevent traffic jams by better stability

No accidents (?)

Less congestion delay

Better energy efficiency

Non connected
Large penetration

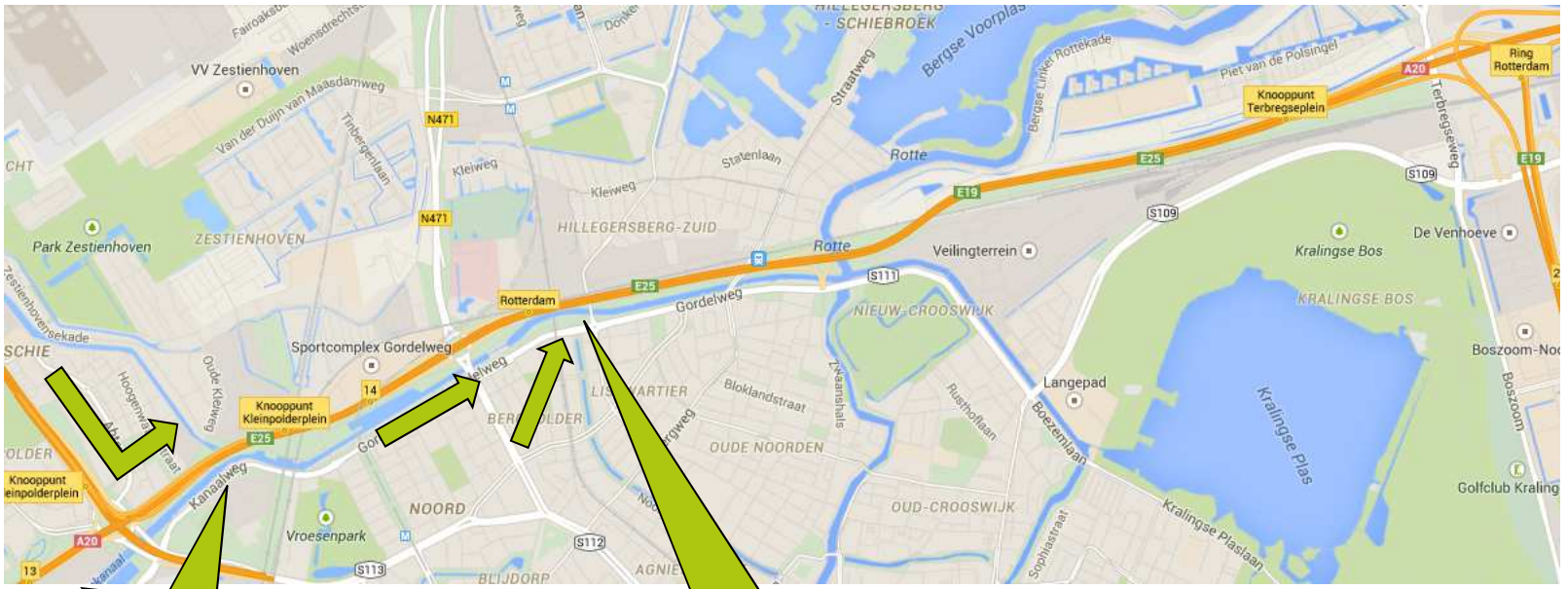
Decreased throughput by larger headways

Decreased stability by lack of anticipation

Increased risk of congestion

All congestion solved?

A20: bottleneck motorway, no more space to expand



3+2 cross weaving

Short on-ramp

How can AVs relieve congestion here?

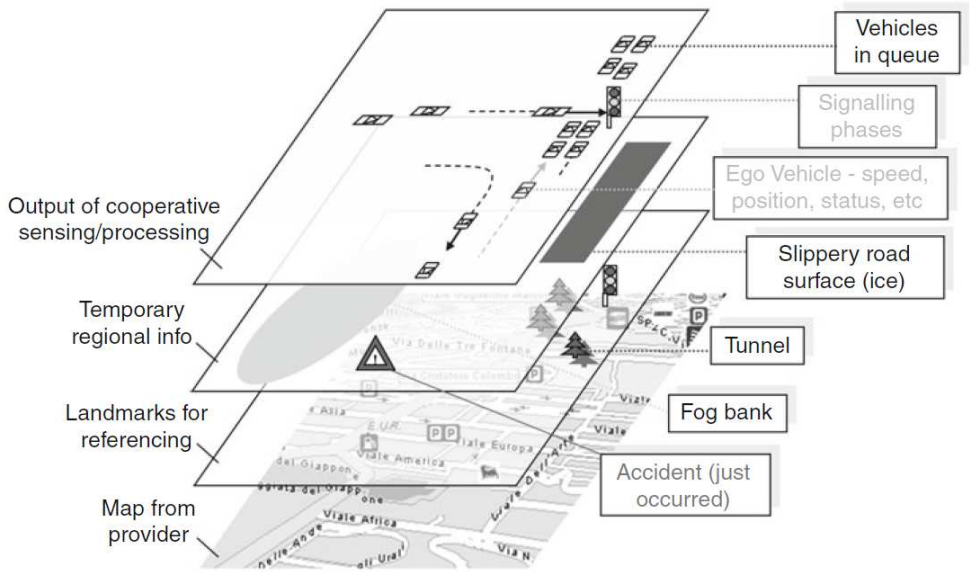
Traffic safety

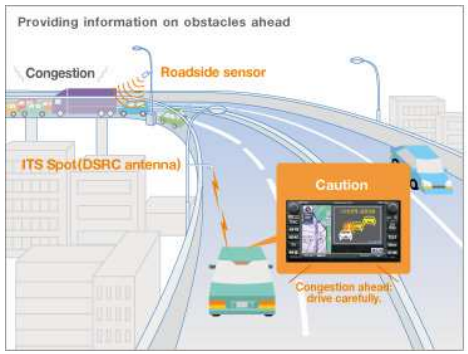
- Level 1 werd ook wel ‘preventive safety’ genoemd
- Verzekeraars rapporteren daling claims auto’s met level 1 systemen.
- Minder schade door parking assist
- Veel aandacht voor detectie voetgangers/fietsers

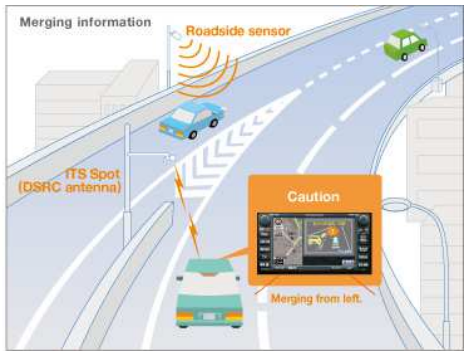
- Veiligheid is absolute randvoorwaarde
- Er zullen ongevallen optreden met automatische auto’s
- Compenserend gedrag nog onbekend

Digitale infrastructuur

Local dynamic maps
Draadloze communicatie
In-car traffic management
Security, privacy, reliability







Autorijden wordt aantrekkelijker!

Partial automation

Meer comfort,
Minder ongevallen
Minder files

High automation

Reistijd kan deels nuttig worden besteed

Full automation

Reistijd kan volledig nuttig worden besteed

Meer auto verplaatsingen?

Afname files maakt latente vraag manifest

Autoverplaatsingen worden aantrekkelijker

Andere activiteiten?

4-8 % VMT increase (Gucwa, 2014)

Ruimtegebruik

Functioneel

Ruimtelijk

Geometrisch herontwerp van wegen (smaller?) en knooppunten

Spreiding in vestigingsgedrag mensen en bedrijven neemt toe

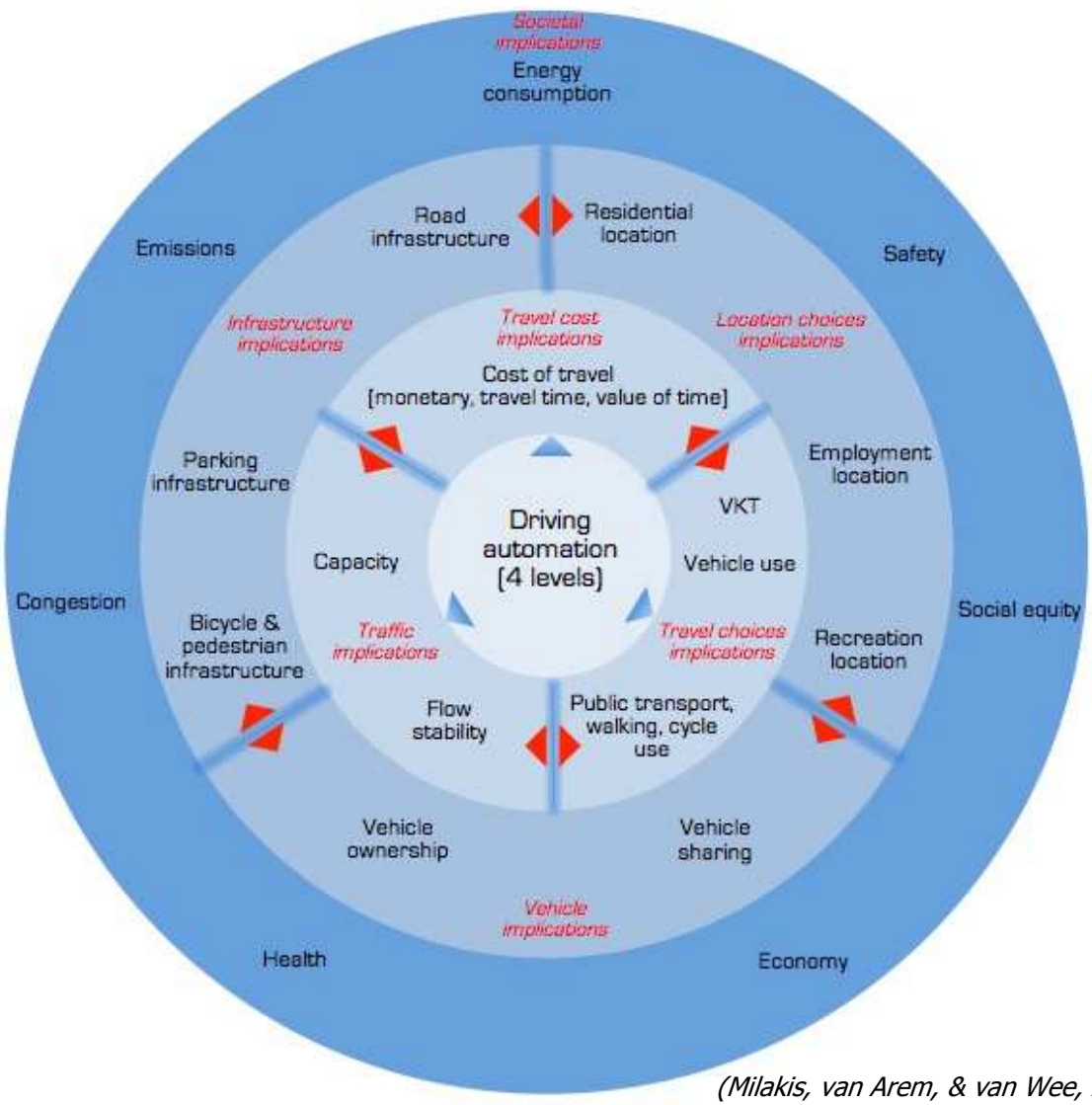
Betere bereikbaarheid leidt tot concentratie

Herontwerp stedelijke, industriele, toeristische gebieden

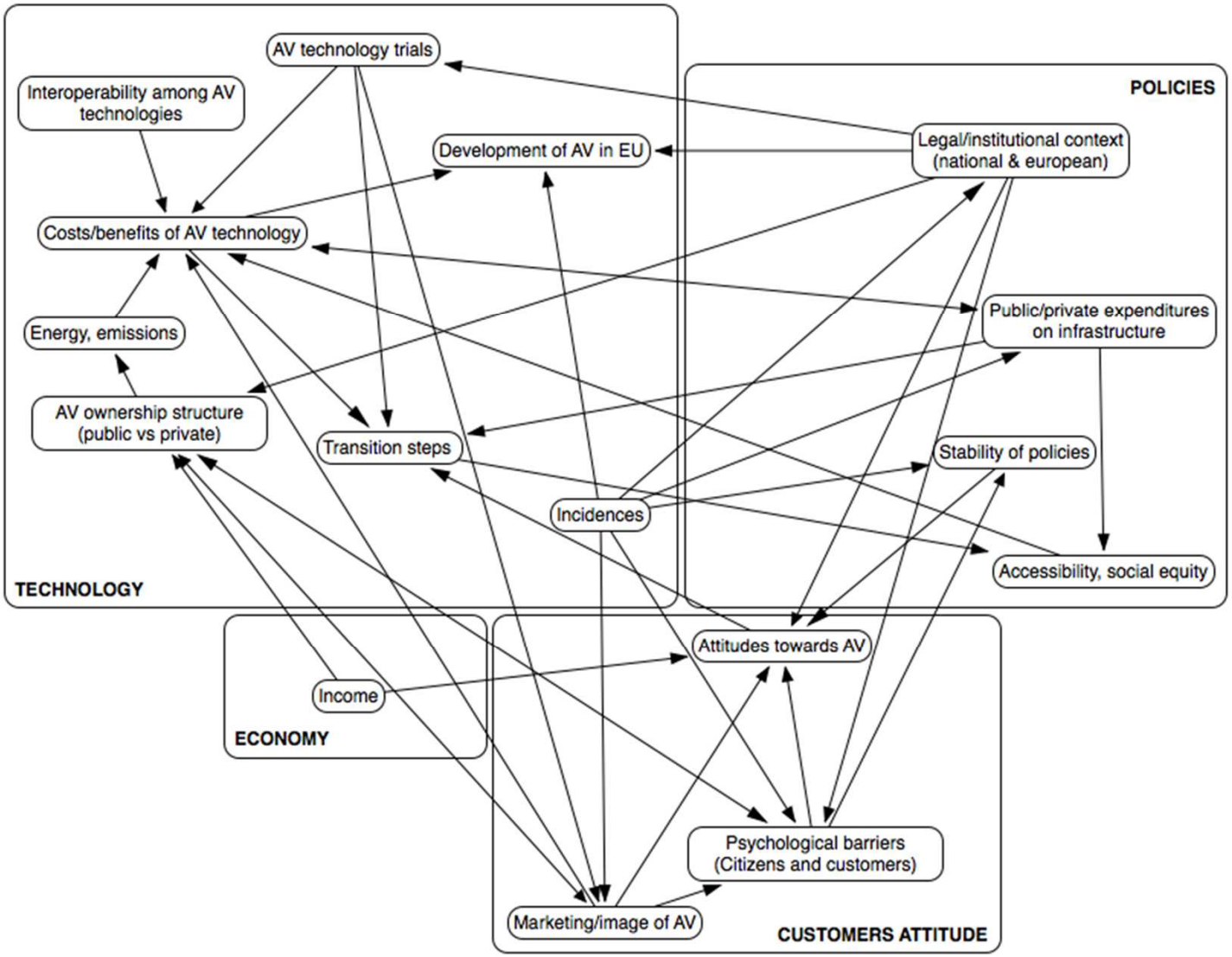
Geen parkeren op straat

Synergie autodelen, elektrisch rijden

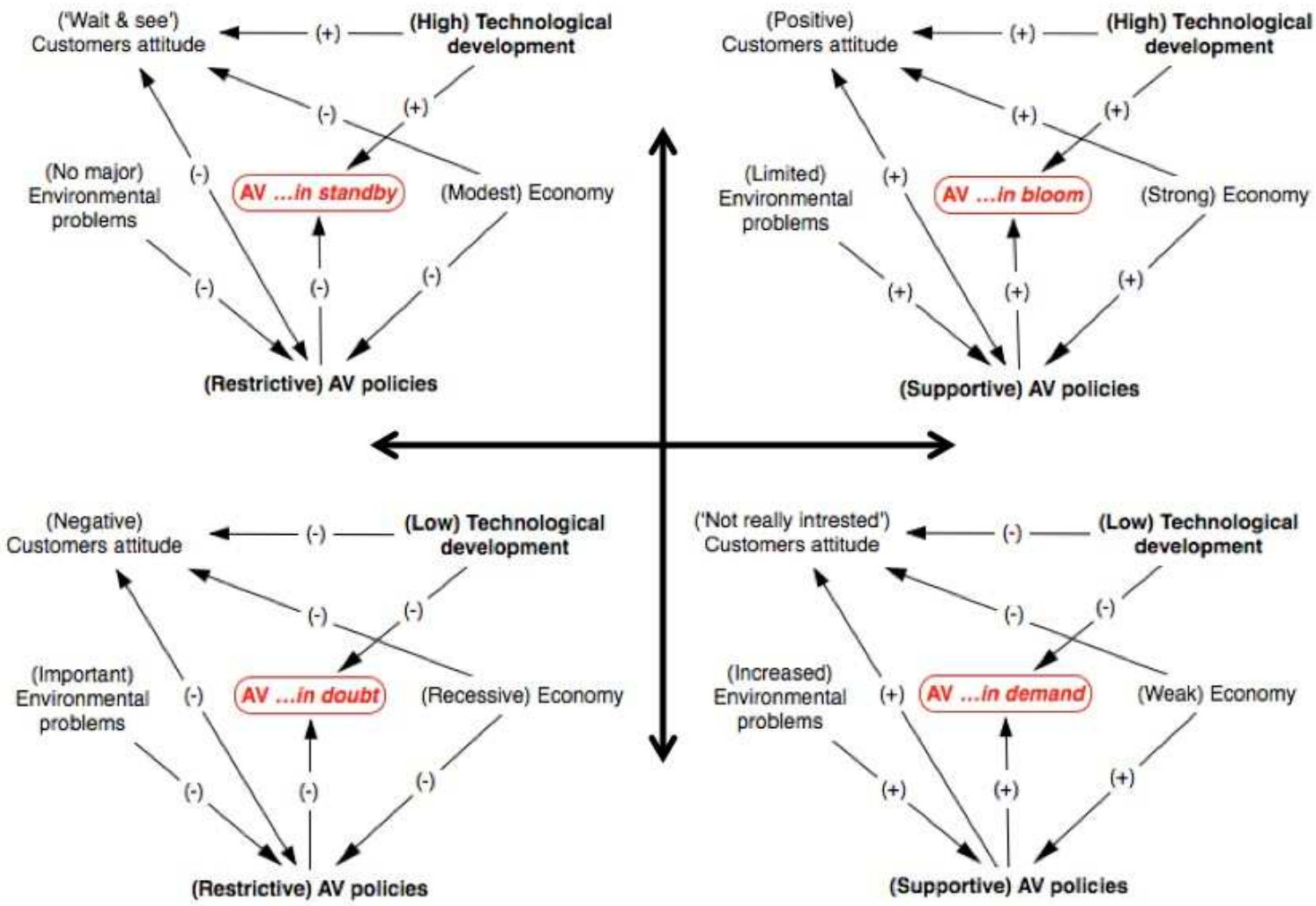
Implications of automated driving



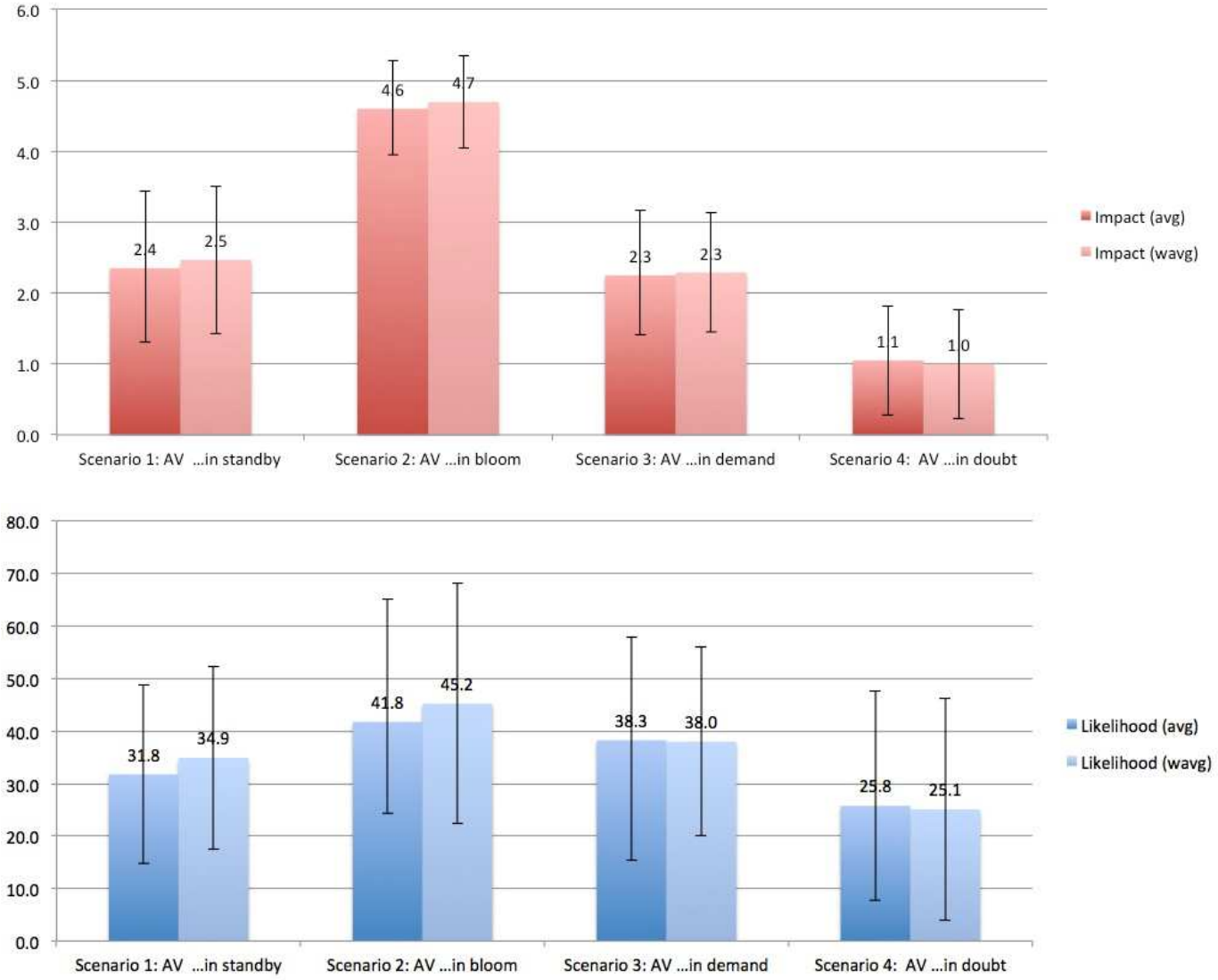
(Milakis, van Arem, & van Wee, 2015; work in progress)


AV technology trials
Interoperability among AV technologies
Development of AV in EU
Costs/benefits of AV technology
Energy, emissions
AV ownership structure (public vs private)
Transition steps
Incidences
TECHNOLOGY
POLICIES
Legal/institutional context (national & european)
Public/private expenditures on infrastructure
Stability of policies
Accessibility, social equity
Income
ECONOMY
Attitudes towards AV
Psychological barriers (Citizens and customers)
Marketing/image of AV
CUSTOMERS ATTITUDE

Development of automated vehicles in the Netherlands: scenarios for 2030 and 2050



(Milakis, Schnelder, van Arem, van Wee, & Correia, 2015; work in progress)


6.0
5.0
4.0
3.0
2.0
1.0
0.0
2.4
2.5
4.6
4.7
2.3
2.3
1.1
1.0
Scenario 1: AV ...in standby
Scenario 2: AV ...in bloom
Scenario 3: AV ...in demand
Scenario 4: AV ...in doubt
Impact (avg)
Impact (wavg)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
31.8
34.9
41.8
45.2
38.3
38.0
25.8
25.1
Scenario 1: AV ...in standby
Scenario 2: AV ...in bloom
Scenario 3: AV ...in demand
Scenario 4: AV ...in doubt
Likelihood (avg)
Likelihood (wavg)

Summary

- Infrastructure conditions unknown
- The driver is key, need naturalistic automated driving data
  - Conditions of use, Activation/deactivation, Traffic safety, behavioral adaptation
- New traffic management algorithms
- Impacts at real bottlenecks
- Dynamic digital map for automated driving- secure and reliable
- Low speed automation: what are the limits?
- Long term impacts may be considerable