INTRODUCTION

Mobility impacts of automated driving and shared mobility in metropolitan areas
INNOVATION PROCESS

DEVELOPING FUNDAMENTAL KNOWLEDGE
Together with universities

DEVELOPING KNOWLEDGE
In public-private collaboration with partners from the golden triangle

APPLYING KNOWLEDGE
Contract research for and with customers

TRANSFERRING KNOWLEDGE
Exploiting knowledge through spin-offs, licences, etc together with other companies
DISRUPTIVE DEVELOPMENTS

Not (only) about MaaS event
MOTIVATION FOR THE STUDY

SHARING

• Transition from owning cars and bikes to using
• Both car sharing and ride sharing are part of this trend

AUTONOMOUS VEHICLES

• Many car manufacturers and tech companies working towards automated vehicles
• Experts do not yet agree on pace of change and final outcome
RESEARCH GOAL AND METHOD

Aims:
✓ Impacts of automated vehicles
✓ Discuss the social, economic and spatial implications
✓ Implications for governance: infrastructure manager and public transport concession holder
✓ Explore opportunities & mitigate unwanted effects

Method:
✓ Multidisciplinary working sessions on scenarios and interventions
✓ Quantitative estimation of mobility & traffic impacts
✓ Qualitative estimation of air quality, traffic safety, economy and spatial planning
EXPLORE IMPACTS FOR ENTIRE PROVINCE (STATE) – NOT JUST THE CITY OF AMSTERDAM

Densities in the Netherlands
SCENARIOS

- **Scenario 1**: Level 5 automation, high sharing
- **Scenario 2**: Level 5 automation, low sharing
- **Scenario 3**: Level 3/4 automation, low sharing
- **Scenario 4**: Level 3/4 automation, high sharing

**L3/4 - sharing**

**L5 - sharing**

**Level 3/4 automation**

**L3,4- no sharing**

**L5 - no sharing**
## REGION TYPES (WHICH NEW MODES WHERE?)

<table>
<thead>
<tr>
<th>Region Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>Very highly urbanized areas:</td>
<td>Amsterdam city centre Amstergem Zuid.</td>
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<tr>
<td>Highly urbanized areas:</td>
<td>Rest Amsterdam, center Alkmaar, Hilversum en Haarlem.</td>
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<tr>
<td>Other urbanized residential/work areas:</td>
<td>Enkhuizen, Heerhugowaard, Ijmuiden en Bussum.</td>
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<td>Rural residential and recreational areas:</td>
<td>Lutjebroek, Ankeveen, Callantsoog</td>
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<td>Hubs en mainports:</td>
<td>Amsterdam airport, Amsterdam port, Greenport Aalsmeer, Greenport Noord-Holland and Tata Steel.</td>
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TRANSPORT MODES INCLUDED

Used the following new modes:

- Automated (private) car
- Automated taxi (not shared)
- Automated shared taxi (rides)
- Automated shared van/bus (rides)

Plus conventional modes:

- Low speed shuttle (last mile solution)
- Walking
- Cycling
- Automated truck
- Train
- Truck platoons
- Bus/Tram/Metro
- Regular car and car passenger
IMPACTS WITHOUT INTERVENTIONS – MODAL SPLIT (TRIPS)

Dramatic increase in the use of automated vehicles due to convenience. Mass congestion as a result.
TRANSPORT IMPACTS

AVs = Congestion X 2.5
IMPACTS WITHOUT INTERVENTIONS – MODAL SPLIT (TRIPS)

Dramatic increase in the use of automated vehicles due to convenience. Mass congestion as a result.
Transport Impacts

Decrease of walking and cycling
IMPACTS WITHOUT INTERVENTIONS – MODAL SPLIT (TRIPS)

Dramatic increase in the use of automated vehicles due to convenience. Mass congestion as a result.
TRANSPORT IMPACTS

Sharing requires incentives
## ASSESSMENT OF IMPACT ON POLICY GOALS

<table>
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<tr>
<th>Policy goal</th>
<th>Rating</th>
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<tr>
<td>Accessibility</td>
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<tr>
<td>Traffic safety</td>
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<tr>
<td>Sustainability / Liveability</td>
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<td>Social development</td>
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<tr>
<td>Economic development</td>
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<tr>
<td>Spatial development</td>
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</table>

- **Social development**: access to transport & labour effects
  - Vision needed to leverage towards societal goals
- **Economic development**: maintenance cost and tax incomes
- **Spatial development**:
  - Change in population spread: city centre – lower income, rural areas – higher income
  - Decline in parking, increase in pick and drop off
CONCLUSIONS

- Automated and shared mobility can have a major impact on metropolitan areas
  - Vision needed to leverage towards societal goals
- A far-reaching mix of interventions may be needed to ensure the liveability and accessibility
  - Adaptive policies are required
- Impact mechanisms are clear, despite uncertainties w.r.t. implementation path, time and costs parameters and user acceptance and preferences to new modes
  - Create a learning cycle using pilots
THANK YOU FOR YOUR ATTENTION

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Take a look: TIME.TNO.NL
CONCLUSIONS

- Automated and shared mobility can have a major impact on the traffic and transport system

Recommendations:
- An integral, adaptive network vision for traffic and transport connections, including automated vehicles, sharing concepts and other developments (such as MaaS)
- Inclusion of findings in further studies and policy documents

A far-reaching mix of interventions may be needed to ensure the liveability and accessibility of the urban area types

Recommendations:
- Further research into the most effective mix of interventions that 1) reduce the number of vehicle kilometers & delays and 2) increase the share of bicycle, walking and public transport.
- Given the major changes in mode choice and mileage, consider the consequences for, among other things, accessibility and (public) space.
CONCLUSIONS AND RECOMMENDATIONS

- The modelling approach presented works well to get first insights into impacts.
- Impact mechanisms are clear, despite uncertainties w.r.t. implementation path, time and costs parameters and user acceptance.
- Short computation time allows exploration of large numbers of scenarios, sensitivity analyses and assessments of the impacts of interventions.
- Model can be extended easily to include more emerging modes and parking concepts.
- Recommendations:
  - Replace current methods used for each sub-model by more detailed methods.
  - Include other phenomena such as zero-occupant vehicle demand and the impact of automation on car ownership.
  - Reduce uncertainties in assumptions by carrying out stated preference research and pilots.
  - Get a clearer view on the transition phase.