Automated transport, curse or blessing?  
A small cities’ view on AV’s

Gert Blom  
Strategic Advisor Mobility - city of Helmond (NL)  
ITS Innovation Manager – ITS Agency BrabantStad
Mobility policy Helmond

Optimizing the use of existing infrastructure

Urban traffic solutions technology driven: ITS

Active support of smart mobility pilots and showcases
FREILOT Energy Efficient Intersection Service
The example of Helmond (NL)

14 equipped intersections in urban zone

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of crossings</th>
<th>Number of stops</th>
<th>% of stops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>408</td>
<td>52</td>
<td>13%</td>
</tr>
<tr>
<td>Pilot</td>
<td>343</td>
<td>20</td>
<td>6%</td>
</tr>
</tbody>
</table>

Number of crossings and stops in both periods

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Pilot</th>
<th>Rate of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{CO}_2) emissions (g/km)</td>
<td>644</td>
<td>562</td>
<td>-13%</td>
</tr>
<tr>
<td>(\text{NO}_x) emissions (g/km)</td>
<td>3.87</td>
<td>3.33</td>
<td>-14%</td>
</tr>
<tr>
<td>Fuel consumption (l/100km)</td>
<td>24</td>
<td>21</td>
<td>-13%</td>
</tr>
<tr>
<td>Speed (km/h)</td>
<td>35</td>
<td>36</td>
<td>+2.6%</td>
</tr>
</tbody>
</table>

Emissions, consumption and speed variations

Source: FREILOT project
Next ITS steps for Helmond ...

➢ Contribute to large scale deployment of C-ITS
  ➢ EU- Projects **C-Mobile, C-TheDifference, CAPITAL**
➢ Prepare for introduction and transition towards automated vehicles
  ➢ EU- Projects **MAVEN, AUTOPILOT, CoEXist**
MAKING AUTOMATION WORK FOR (small) CITIES

Public Transport in small and medium sized cities

• Low PT demand throughout the day.
• Demand strongly concentrated at peak hours.

Result:
• Sometimes ridiculous C/B ratio for PT (drivers salaries – empty busses)
• Strongly limited PT available outside peak hours.
• Hardly any PT to outlying rural areas.

Therefore strong focus on private cars as the main means of transport.
Example: City of Helmond: 4 train stations, but limited PT connections to schools, the automotive campus, industrial areas and the surrounding rural area.
The automotive campus and other industrial areas
Major secondary schools
Around Eindhoven – Helmond large low density area with little PT
MAKING AUTOMATION WORK FOR (small) CITIES

Proposed solution:

**On demand small automated shuttles.**

- Vehicles only operate when there is a demand (saves fuel and pollution).
- Less drivers needed (saves salary costs).
- Transport is available anytime (also during weekends and at night).
MAKING AUTOMATION WORK FOR (small) CITIES

Start with connections between public transport hubs and schools, industrial areas, shopping centres, etc.

Expand step by step to include all possible required low demand connections and private living addresses.

If needed in combination with scheduled automated shuttles or (automated) bigger buses during peak hours.
Example proposed project City of Helmond: Connection between main train station and the automotive campus:
Automated shuttles: challenges and opportunities

Challenges:
• Normal city speeds (up to 50 km/h) in mixed city traffic
• European laws still prohibit driverless vehicles from using public roads (but exceptions are possible)
• Fully automated vehicles not integrated in existing public transport networks
• Possible modal shift from cycling & walking to using the shuttle
• The increased availability of public transport might enable people to live further away from work and thus increase total miles travelled
Automated shuttles: challenges and opportunities

Opportunities:

• Dramatic improvement of the service level at lower costs
• On demand service instead of (infrequent) scheduled service
• Use of the existing road network, with minimum infrastructural adaptations
• Transport capacity can be increased at peak times by including additional vehicles
• Replace the private car as the preferred transport option for many trips, with advantages for the environment, congestion and energy consumption
The real challenge for ITS ...
For more information please contact

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g.blom@helmond.nl
Mobile: +31 6 53 21 48 51
Some preliminary views from European cities and regions on AVs

Gert Blom, city of Helmond/Polis
What is Polis?

Network

70 European cities & regions

Innovation

European Institutions

Sustainable urban mobility

- environment & health
- mobility & traffic efficiency
- safety & security
- economic & social aspects

Exchange of experiences

European research

SMART CITIES – SUMP – URBAN FREIGHT
Why a paper on AVs?

- Concern about optimism bias in the media
- Creating expectations that automated vehicles will be widely deployed in short term (5-10 years?) and will always work perfectly
- Only the potential benefits are highlighted – rarely the potential disbenefits
- AV developments are mainly technology and vehicle driven – few public authorities are engaging

Aims of paper:
- Raise awareness and promote reflection about AVs among local and regional authorities
- Communicate views of cities and regions to policy makers & other AV players
- Challenge AV sector to develop products and services suited to urban context
When will automation come?

Volvo plans autonomous cars by 2021. USA CEO says

By Thomas Lee, San Francisco Chronicle

18 July 2017

CES 2017: Nvidia Field a Level 4 Years

By Phillip E. Ross

Posted 5 Jan 2017 | 14:30 GMT

When do you think 10% of the vehicle fleet in your city will be automated vehicles?

- 0-5 years: 1
- 5-10 years: 3
- 10-20 years: 5
- 20-30 years: 9
- 30+ years: 4

www.polisnetwork.eu
Partial automation – is it really safe and what are the benefits in urban areas?

A study into driverless cars has cast doubt on whether the technology is ready for general deployment, with researchers finding that it is unsafe for a driver to switch from automated driving to manual control in order to ensure maximum safety.

A team from the University of Southampton have been testing ‘control transition times’ for participants to take action to avoid a collision.

The researchers believe their findings will be used to estimate the lead time needed to take control of a vehicle, and the average time needed for a person to successfully take over the task.

The authors observed 26 men and women, with simulated driving at 70mph, with and without a human driving task.

They recorded response times as the drivers took control of the system.

The first generation of partially "self-driving" cars is being touted nationally as the answer to America’s growing traffic fatality rate. But the reality is there is nothing safe about partial automation, and in the very glow of what could be, these unproven technologies are being allowed on city streets, using real people as stand-ins for crash-test dummies.

The current generation of partial automation is not part of a drive to safety; it’s a drive to get to market first with little-tested technologies.
Some possible implications of AVs

**Travel behaviour**

- Worst case: projected increase in kms travelled
- Best case: removal of private cars in favour of shared mobility + public transport, combined with walking & cycling

Prerequisites for best case
- Massive modal shift: not easy given attachment to car for independent mobility
- Redundancy of fleet vehicles during off-peak: unrealistic given fleet manager drive for economic efficiency

Deployment expectation: somewhere on spectrum between best and worst case

Local/regional authorities need to determine point on spectrum where AVs can deliver most benefit to their city or region and develop policies accordingly.
Some possible implications of AVs

**Spatial**
- Some off and on-street parking could become redundant - but newly created road space must be put to other functional uses to prevent it being taken up by traffic or remaining vehicles
- Urban sprawl and longer commuting trips

**Social**
- Enhance accessibility to persons with limited transport access by reducing cost of service provision
- Risk of increased social division and inequality if market-driven approach

**Road safety**
- Reduction of driver distraction
- Vehicles programmed to obey traffic rules
- Interaction with non-automated road users, especially VRU
- Ethical issues
Some possible implications of AVs

Traffic efficiency
- Connected automation = improved traffic forecasting and distribution
- “More pain that gain” in short-medium term due to co-existence and higher safety margins

Investment
- Infrastructure – physical changes & digital networks
Automated vehicles – aspects cities need to explore

Urban planning & development
AV services
VRU safety

Travel behaviour

Traffic management implications

www.polisnetwork.eu
Preliminary recommendations

- City and regional authorities should build and implement AV policies to guide their introduction in the most effective manner
- A structured dialogue between the public sector and AV industry needs to be established
- Research on the potential impacts of AV on urban and regional transport is needed (travel behaviour, VRU interaction/safety, infrastructure implications, new transportation services, etc)
- EU and national policy on AV should give greater consideration to sustainable urban mobility policy
What views, questions or concerns do you have regarding the (changing) role and responsibilities of a traffic manager?

Suzanne Hoadley
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www.polisnetwork.eu
Development of an Analysis/Modeling/Simulation (AMS) Framework for V2I and CV Environment

Jiaqi Ma, Ph.D.
Research Scientist / Project Manager
Leidos, Inc

U.S. Department of Transportation
FEDERAL HIGHWAY ADMINISTRATION
• CAV systems are likely to be major game changers in traffic and mobility.

• When, in what form, at what rate, and through what kind of evolitional path.

• Agencies at a loss for how to approach the problem, and how to go about planning and designing for new operational regimes in which vehicles are connected to each other and to the infrastructure, and augmented with automated capabilities.

• Present modeling and simulation tools not adequate to capture either demand or supply-side implications for the transportation system.

• *At the root of these impacts are the flow and operational aspects* of CAV vehicles, especially as these become part of the traffic mix served by our transportation infrastructure.

• These aspects are determined by human decisions, as drivers, owners, users of connected/autonomous vehicles.
Background and Understanding II

- Broader planning considerations:
  - Demand side: impact of CAV on individual and household activity patterns
  - Supply side: emergence and growing role for shared mobility fleets, though private ownership not likely to go away.

- Future deployment likely to see slow penetration of connectivity in certain parts of the network, and initial automated vehicle fleets, in selected environments: Need to model CAV capabilities in mixed traffic flows, with both human drivers and robotic ones.
Current Major FHWA Effort

- “Development of an Analysis/Modeling/Simulation (AMS) Framework for V2I and CV Environment”

- The objective of this task order is two-fold:
  1. Lay foundational framework for development of AMS tool capability that includes connected and automated vehicles, and
  2. Engage in small scale V2I AMS development, using this framework, that encourages future development activities, toward a vision where practitioners have CAV-aware tools available.

- The project sets the context for developing the AMS tool framework by introducing a broader methodological framework for evaluating the changes entailed by CAV technology to:
  1. Supply of mobility services
  2. Demand and behavioral changes
  3. Network/facility operational performance
CAV AMS Framework

Potentially major changes in
▪ Travel and activity behaviors
▪ Supply side, e.g. new mobility options

Source: Mahmassani, et al, 2017
Are Tools Adequate?

• Existing state-of-the-art tools could address *incremental scenario*

• Flow modeling aspects require additional calibration as technology prototypes appear; interaction between driverless and other vehicles biggest challenge, but traffic modeling community is rising to the task.

• More *uncertainty on behavior side*, though incremental scenarios could be explored under selected assumptions.

• Telecommunications aspects of V2V and V2I missing from existing traffic models
Are Tools Adequate?

- New mobility supply options under *Less Incremental Scenario II* are not within scope of any existing models.
- There are no models in planning practice that can predict emergence of new modes and forms of mobility.
- Typically provided exogenously to the models, in the form of scenarios to be analyzed.
- Existing models (ABM and supply-side) not up to the task of modeling full implications of these new mobility supply scenarios.
Next Phases

• Use existing datasets or design experiment to collect more data for model calibration
• Select 3 – 5 sites for modeling deployment and testing (of selected CAV applications)
• Develop CAV AMS toolbox
• Work with agencies to conduct case studies, focusing on early deployment opportunities
  – Cooperative Adaptive Cruise Control
  – Intersection Approach and Departure
  – Speed Harmonization
Jiaqi Ma
Email: jiaqi.ma@leidos.com
Saxton Lab: https://www.fhwa.dot.gov/research/tfhrc/labs/operations/
Me: http://jiaqima.wixsite.com/jiaqi
Project site: under construction
Making Automation Work in Boston

one year of seagulls, bureaucracy, and learning as we go

Kris Carter, Co-Chair
Mayor’s Office of New Urban Mechanics
City of Boston

Automated Vehicle Symposium
July 12, 2017
The Department of Yes

EXPLORE

EXPERIMENT

EVALUATE (+ HAND-OFF)

“Coffee’s for Collaborators”
Snapshot of Boston’s AV work in 12 minutes (+/-)

1. Our Framework and Motivation
2. Vehicle Testing Protocol
3. Area of Interest: Infrastructure
### Citizen-voiced goals through GoBoston 2030

<table>
<thead>
<tr>
<th>Goal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Make Boston’s neighborhoods interconnected for all modes</td>
</tr>
<tr>
<td>Safety</td>
<td>Substantially reduce crashes through design and education</td>
</tr>
<tr>
<td>Reliability</td>
<td>Make travel predictable on transit and roadway networks</td>
</tr>
</tbody>
</table>
## Citizen-informed vision

**How can autonomous vehicles support the goals in GoBoston 2030?**

<table>
<thead>
<tr>
<th>Access</th>
<th>better connections to major transit lines.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>a reduction in human-error caused crashes by 90%*</td>
</tr>
<tr>
<td>Reliability</td>
<td>connected vehicles could mean better efficiency and more predictable transportation</td>
</tr>
</tbody>
</table>

*personally skeptical of this number
Motivation: Safety

Boston

22  |  4,548

Source: 2016 Boston Vision Zero
Motivation: Safety

90% reduction

2  |  455

Source: 2016 Boston Vision Zero
Motivation: Reliability & Resilience

(un)Official MBTA Snow Map
February 2015

Source: Sara Morrison
Motivation: Better Access

Average commute in Boston is 29 minutes.

24% of Mattapan residents have a commute over 60 minutes.
Motivation: Ensuring Equitable Access

Source: Boston Globe
If you’re not at the table, you’re on the menu
Vehicle Testing: Why Boston?

1. Political support
2. Challenging weather conditions
3. Unique infrastructure / driver & pedestrian behavior
4. Local talent pool
5. Real transportation needs to address
Ten Month Timeline

- **Feb 2016**: Submit groundbreakingy awesome application to USDOT Smart Cities Challenge
- **March 2016**: Adapt USDOT application to WEF Smart Mobility Focus City project
- **May 2016**: Start talks with nuTonomy about testing
- **June 2016**: Kick-off WEF AV initiative
- **Sept 2016**: Issue Executive Orders
- **Oct 2016**: Sign MOU with nuTonomy
- **Nov 2016**: Rejected by USDOT Smart Cities Challenge
Governance: Boston’s Approach

MAYOR WALSH SIGNS EXECUTIVE ORDER ON AUTONOMOUS VEHICLES

“...that our expected preferred deployment will be fleets of autonomous vehicles that are electric and shared...ensure equitable access to opportunity for those least well served by transportation options today, including seniors, youth, and those with physical disabilities.”
Governance: Boston’s Approach

1. Sign an MOU with the City & State
2. Develop a testing plan with the City
3. Submit an application to the State citing experience and safety criteria
Vehicle Testing Starts January 1, 2017

Shared Research Agenda

MOU and Quarterly Reports

Support in Socialization of AVs
Vehicle Testing: Phased Approach

Testing phases

A
Off-site testing

B1
100 miles, Marine Industrial Park, day time only, good weather

B2
100 miles, Marine Industrial Park, day and night time, mixed weather

C1
200 miles, South Boston Waterfront, day time only, good weather

C2
200 miles in South Boston Waterfront, day and night, mixed weather

D1
400 miles in City of Boston, day time only, good weather

D2
City of Boston day and night time, mixed weather
Vehicle Testing

**Phase B Area (191 acres)**
- ✓ no traffic signals
- ✓ limited traffic

**Phase C Area (1,000 acres)**
- ✓ Signalized intersections
- ✓ Bridges
- ✓ Left turns
- ✓ Multi-lane roadways
- ✓ Pedestrian activity
- ✓ Bike lanes
- ✓ Underpasses / Overpasses
- ✓ Rotaries
- ✓ On-street parking
Fahckin' Seagulls Menace Boston's Self-Driving Cars

Ryen Felton
2/07/17 4:16pm • Filed to: CAR TECHNOLOGY
Vehicle Testing

BECAUSE WE WANT YOU TO GET WHERE YOU'RE GOING

BOSTON tested in...
Lyft/NuTonomy choosing Boston to test its self-driving cars is like choosing to play against LeBron in a pickup game.

11:35 AM - 6 Jun 2017
Infrastructure: How do we fund roads in the future?

City of Boston Roadway Projects (FY16):
$45M road reconstruction & bridge maintenance
$9M Resurfacing roadways

City Transportation Related Revenue:
$58M in Vehicle Excise Tax payments (FY18)
$61.3M in Parking Fines (FY18)
$16M in Parking Meter Fees (FY18)

$135M in City Revenue
$766M in MA state gas tax revenue
Infrastructure: Fleets of Sensors
Infrastructure: Getting AV Ready

Boston Parking Atlas & Rules Census (BPARC)

- Digital record of the curb
- Operations tool
- Building towards an API

Completed to date:
- 37.9 linear miles of curb
- 9,372 assets
- 61 are inconsistent or conflicting
What Boston Has Learned So Far

1. The City should set a clear vision

2. Strong relationships are critical for trust and collaboration

3. Don’t let the perfect by the enemy of the good

4. Iterate
It’s 2017
Where’s My

Thank you
@Kris_W_Carter
kristopher.carter@boston.gov
boston.gov/mechanics

Source: XKCD
Breakout Session #20: "Making Automation Work for Cities"

Aims:
• Discuss status of automation in cities in the US and Europe – from a city perspective.
• Identify key elements of an "automation ready" framework that helps to meet urban policy goals.

Recommendations
1. Make sure you have clear, widely supported policy goals – and expected CAV contributions.
2. Create a strong multi-stakeholder partnership (private-public, public-public, between departments, state/national support?).
4. Manage (complex/ contradictory) citizen expectations. Communicate "It is innovation".
5. Keep an eye on the business case.
Breakout Session #20: "Making Automation Work for Cities"

Recommendations
6. Think about **impact assessment** "from day 1"
7. Identify clear **performance measures** for automated services/providers (local KPIs).
8. Clarify expectations on **users' cross-brand experiences** (or a uniform local brand?).
9. Involve **other municipal services** (e.g. waste collection, street cleaning, snow plowing)
10. **Space management** is a key future challenge (on-street/off-street)
11. Ensure automation is part of an **innovation cycle** (incl. learning).
12. Synchronize **technology and policy transition**: the new mobility paradigm in your city.
13. Consider the wider **transition landscape** (MaaS, digital infrastructure, energy, etc) and how supporting ecosystems can contribute (e.g. planning, labour relations, procurement)
14. Engage in **learning and exchange** activities, including international dialogue.
Thanks to the co-organisers, note takers!

- Jane Lappin – Toyota Research Institute
- Scott Smith – US DoT / Volpe Center
- Dirk Heinrichs – Institute of Transport Research - German Aerospace Center (DLR)
- Ellen Partridge, Environmental Law & Policy Center
- Amitai Bin-Nun – Securing America’s Future Energy (SAFE)
- Bryan K. Pounds, MassDOT, Office of Transportation Planning
- Karen Vancluysen – Polis
CCADs and the Cities

Expectations and Impacts
The Austrian way forward

Martin Russ - AustriaTech
Basic questions

• WHICH Cities?
• Who is THE CITY?
• How to define the CONTEXT of CCAD for them?
• How WE WORK with the Cities?
• What Cities LIKE – and not?
• How to MEASURE impacts?
• How to build EXPERIANCE?
• How to get ready and to define CCAD READINESS?
Austrian perspective – Action Plan on CCAD

- Test- and learning environments & RDI projects – Use Case based
- Testing on public roads
- DTI → operating environments
- Dialogue: Policy & Admin with Industry

+ international activities (tech. & legal)
+ Impact assessment & evidence

Transport system & Policy transition
Safeguard „+“ impact
Generate added value
City Use Cases - Timeline

1. Safety
2. Time
3. Services
4. Access
5. Logistics
6. Space
CCAD Environment

- User Environment
- Policy Environment
- Business Environment
- Society

product
... The Mobility Transition Landscape

- Clean Energy
- Mobility as a Service
- Digital Infrastructure
- Automated Driving
- Connectivity

Foresight & Planning
Evaluation & Monitoring
Value Creation & Labour Market
Innovation & Procurement EcoSystem
Work with „THE CITY“

- Economy (services)
- Road authority
- Traffic & transport management
- Freight, logistics, retail
- Planning departement
- Public transport
From expectations towards experiences!
HOW WILL CITIES USE AUTOMATED VEHICLES?
Most of the time, studies on the urban scale estimate possible effects reducing the city to a passive entity.

Practically non-existent, is a discourse on the needs and problems & opportunities on the next scale of society - the city.
AVENUE21 – OBJECTIVES

- Start from challenges European cities face and ask how AVs will be related to them

WHAT ARE THE AIMS WE PURSUE WITH AVS, ON THE LEVEL OF THE CITY?

- This question, can only be answered by looking at cities, past and present, understand their needs.
AVENUE21 – OUTLINE

- Understand current challenges of European cities
- Develop understanding of past transport-revolutions
- Monitor international pioneer-regions/cities
- Work with case studies (London, Randstad, Vienna)
- Expand on opportunities for planning and governance
Economic Impact (CCAD and new services as growth factor)

Societal impact & dialogue; Policy, Trust, Ethics and Legal frame

Direct system effects: Safety & network

Indirect effects: Behaviour, land-use, environment

1st things 1st

High uncertainty

Low impact

Low uncertainty

High impact

time
...and next – the readiness of my city

- Political & legal
- Economical
- Environmental
- Technological
- Infrastructure
- Social Acceptance

Form into Strategy & Action
What we do..

- Dialogue with Austrian cities
  - + engage with neighbouring countries
- Bring discussion on EU level
  - Member States & Cities
- Engage with „multipliers“ – PT and Rail
- Dialoge & experience with citizens
- ... and move beyond cities
Cities first actions

- Define role of CCAD Use Cases for mobility system
- CCAD Fitness
  - Applications, Use Cases
  - Readiness & Frame (legal, planning, platforms)
  - user groups
- Scenarios
  - What I want – and how to handle the unwanted
- Learning & knowledge in policy & public sector
Some first practical issues – shuttle experiments

- Interaction Vehicle-Infra-User
- HMI and user experience (across brands)
- C-ITS & connectivity
- Operating environments (TM, infra, maps, scaling)
- Integrate nodes & modes
- Plan – simulate - operate
Bridging the gaps

Give space – knowledge
Policy – technology
Innovation- & transportation-policy
User/vehicle & system
Ethical & beyond horizon
Expectations & experiences
Marketing & market
Breakout Session #20: "Making Automation Work for Cities"

Aims:
• Discuss status of automation in cities in the US and Europe – from a city perspective.
• Identify key elements of an "automation ready" framework that helps to meet urban policy goals.

Recommendations
1. Make sure you have clear, widely supported policy goals – and expected CAV contributions.
2. Create a strong multi-stakeholder partnership (private-public, public-public, between departments, state/national support?).
4. Manage (complex/contradictory) citizen expectations. Communicate "It is innovation".
5. Keep an eye on the business case.
Breakout Session #20: "Making Automation Work for Cities"

**Recommendations**

6. Think about **impact assessment** "from day 1"
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- Ellen Partridge, Environmental Law & Policy Center
- Amitai Bin-Nun – Securing America’s Future Energy (SAFE)
- Bryan K. Pounds, MassDOT, Office of Transportation Planning
- Karen Vancluysen – Polis
Welcome to Breakout Session 20: "Making Automation Work for Cities"
Introduction

- What cities hope and fear of automation
- What cities do in automation
  - conducting automation pilots to meet key urban policy goals
  - creating enabling policy frameworks for transport automation
  - cooperating internationally?
- Speakers from cities, transit authorities and other urban stakeholders from Europe and the US
  - Boston, Helmond, Milton Keynes, San Francisco County
  - Waste Management Inc
  - Volpe Center, Austriatech
  - POLIS, NACTO
  - US-EU Twin Projects
Thanks to co-organisers!

- Jane Lappin – Toyota Research Institute
- Steve Buckley – WSP Parsons Brinckerhoff
- Scott Smith – US DoT / Volpe Center (also note taking)
- Ellen Partridge, Environmental Law & Policy Center
- Bryan K. Pounds, MassDOT, Office of Transportation Planning
- Amitai Bin-Nun – Securing America’s Future Energy (SAFE)
- Dirk Heinrichs – Institute of Transport Research - German Aerospace Center (DLR)
- Karen Vancluysen – Polis
Agenda

- City presentations
- Break (~ 3:30 PM)
- Expectations of automation
- Panel discussion (What can cities do to make automation work for them?)

Q & A after each presentation
CoEXist

Automation-ready transport models and road infrastructure for the coexistence of automated and conventional vehicles

Siegfried Rupprecht, Rupprecht Consult – Forschung & Beratung GmbH, Cologne/ Germany
CoEXist Concept

- Facilitate step-wise CAV introduction
- Take-up, exploitation and dissemination
- Automation-ready road authorities
- Automation-ready infrastructure
- Automation-ready transport models
- Automation-ready framework
CoEXist Analysis – Modelling - Simulation (AMS) Framework

- **Simulation** (Renault, Vedecom, TASS International, PTV)
  - Create closed-loop connection between Renault & Vedecom CAV control logic with PreScan AV simulator and Vissim traffic flow simulator to extract **behavioural parameters of CAV applications**.

- **Modelling** (PTV and University of Stuttgart)
  - CAV-ready **microscopic** traffic model – PTV Vissim
  - CAV-ready **macroscopic** transport model – PTV Visum

- **Analysis** (VTI – Swedish Road Research Authority)
  - Based on model results develop impact assessment metrics for traffic performance, infrastructure space efficiency and road safety for the CAV context

- **Demonstration** of CoEXist AMS
  - Demonstration in **four European road authorities** (Gothenburg - Sweden, Helmond – The Netherlands, Stuttgart - Germany and Milton Keynes – UK ) with different urban structures and traffic compositions.
WP1 - CoEXist "Automation-Ready" Framework

- **Policy context** of cities
- **Technology** options
- Understanding the **impacts**
- Identify **policy stages**
- "Automation-Ready" **measure portfolio**
  - Transport planning
  - Transport infrastructure
  - Organisational structures, knowledge
- **Recommendations**
  - Review existing transport strategies
  - "Automation-Ready" Action Plan
WP2 CoEXist – AMS tools – Vissim and PreScan
Use Cases

1. Mixed use road space, Gothenburg
2. Accessibility during long-term construction, Gothenburg
3. Signalised traffic junction, Helmond
4. Highway and interurban zones, Helmond
5. Waiting and drop-off area, Milton Keynes
6. AV deliveries and freight, Milton Keynes
7. Road capacity, Stuttgart
8. Driverless cars, Stuttgart
CoEXist and FHWA Project Twinning

- European Commission – US DoT Transportation Research Project Twinning Initiative

  - "Twinning is the **coordination of research** activities in funded research projects of mutual interest, and the collaboration that occurs during the conduct of this research, on the basis of **mutual benefit**."
  
  - Regular **interaction** between project teams, incl. **face-to-face meetings**, at least once per year to exchange information
  
  - Formal "**Twinning Agreement**" and Joint Annual/ Final Reports
  
  - **Flexibility** in defining the scope and depth of cooperation
Aims of cooperation

To exchange information and collaborate

- **define analysis, modelling and simulation (AMS) tools** that incorporate features of connected and automated vehicles (CAV) adequately
- apply AMS tools to several **real world use cases**
- study **CAV impacts** (use cases)
- develop **guidance for deployment**
Strategic aims of cooperation

- To coordinate the definition of a **common representation of connected, automated vehicles (CAV)** in traffic simulation models.

- To help create more **robust modelling products** that produce compatible, and more widely validated outputs (in traffic flow micro-simulation and CAV impact assessment).
Status

- **Twinning Agreement** in preparation
- **Outreach** activities planned
Thank you very much for your attention.

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Impact Assessment for AV Systems

Scott Smith, Volpe Center, US DOT
Are AVs a good thing in your city, or not?

It depends! ...on the following:
• What do we mean by AV?
• What impacts do we care about?
• What are the key uncertainties?
• How will the uncertainties affect the impacts?
What do we mean by AV?

Purpose
• Person travel (residents, visitors, persons with disabilities, etc.)
• Freight (type and size of shipments)

Service type
• Short haul / long haul
• Individual / group
• Fixed route, non-fixed route
• Specialized (e.g., valet parking)

Vehicle ownership
• Privately owned single vehicle vs. fleet

Vehicle type
• Lightweight vehicle (e.g., golf cart)
• Automobile / pod
• Bus
• Truck

SAE level of automation

Available automated driving functions

Operational design domain (ODD)
• Exclusive AV vs. mixed environment
• Type of road (limited access, arterial, local)
• Mapping infrastructure
• V2V, V2I, V2P communications infrastructure
• Road surface and markings
• Environment (lighting, weather)
Impacts
Direct Impacts

- Can be measured in field operational tests
- Can be scaled up to a national level
- Will lead to indirect impacts
- Provide a foundation for assessing the indirect impacts that are of interest to society

Examples
- Response of drivers and other road users
- Vehicle operations
  - Acceleration
  - Car following
  - Gap acceptance
- Safety
- Energy / Emissions
- Personal Mobility
- Cost
- Infrastructure Needs and Operational Design Domain
Indirect Impacts

**Examples**
- Network efficiency
- Travel behavior
- Infrastructure
- Public health
- Land use
- Socio-economic

**Infrastructure Impacts**
- What happens to transit?
- Highway capacity
- Demand (highway, transit)
- Size and weight
- Type of infrastructure
- Implications for revenue and funding
  - Road, transit
Areas of Uncertainty

Technology

Future of AVs and their use

Policy

User Response
Thank you

Sponsorship: US DOT Intelligent Transportation Systems Joint Program Office (ITS JPO)

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- Ellen Partridge, Environmental Law & Policy Center
- Amitai Bin-Nun – Securing America’s Future Energy (SAFE)
- Bryan K. Pounds, MassDOT, Office of Transportation Planning
- Karen Vancluysen – Polis
Recommendations

6. Think about **impact assessment** "from day 1"
7. Identify clear **performance measures** for automated services/providers (local KPIs).
8. Clarify expectations on **users' cross-brand experiences** (or a uniform local brand?).
9. Involve **other municipal services** (e.g. waste collection, street cleaning, snow plowing)
10. **Space management** is a key future challenge (on-street/off-street)
11. Ensure automation is part of an **innovation cycle** (incl. learning).
12. Synchronize **technology and policy transition**: the new mobility paradigm in your city.
13. Consider the wider **transition landscape** (MaaS, digital infrastructure, energy, etc) and how supporting ecosystems can contribute (e.g. planning, labour relations, procurement)
14. Engage in **learning and exchange** activities, including international dialogue.
Envisioning a Great Cities with AV Technology
Major shift in US cities: Singular goal of vehicular movement is giving way...
... to streets that serve many purposes.
AVs carry many promises...

...what does the path look like?

Reduce traffic violence?
Decrease carbon footprint?
Free up public space?
Decrease travel costs?
Decrease vehicle ownership?
Decrease congestion?
Do “driverless” cars mean a people-less city?
NACTO supports automated vehicle policies and regulations designed to:

» promote safety for all street users
» Reduce environmental impacts of vehicle travel
» Support the future vision of cities as great places to live, work, and play
» Rebalance the right-of-way
» Support public transit
» Improve mobility for all

www.nacto.org/policy
Making Automated Vehicles Work for Cities

1. Improving Safety
2. Sharing Data
3. Expanding Transit
4. Democratizing the Curb
1. Improving Safety
1. Improving Safety
1. Improving Safety
2. Sharing Data

Manage Streets in Real Time
3. Expanding Transit
3. Expanding Transit
3. Expanding Transit

Focus on Fixed
3. Expanding Transit

Flexible Route
3. Expanding Transit

Point to Point
4. Democratizing the Curb
4. Democratizing the Curb
Making Automated Vehicles Work for Cities

1. Improving Safety
2. Sharing Data
3. Expanding Transit
4. Democratizing the Curb

mollie@nacto.org
Aims:
- Discuss status of automation in cities in the US and Europe – from a city perspective.
- Identify key elements of an automation ready framework that helps to meet urban policy goals.

Recommendations
1. Make sure you have clear, widely supported policy goals – and expected CAV contributions.
2. Create a strong multi-stakeholder partnership (private-public, public-public, between departments, state/national support?).
4. Manage (complex/contradictory) citizen expectations. Communicate "It is innovation".
5. Keep an eye on the business case.