Automation-Ready
Urban Mobility Planning

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The public image of automation

Source: Google
What do we actually know about automation?

- Definition: **Mobility services** provided by vehicles with a high degree of automation (min. SAE level 4) using C-ITS; versus technological/vehicle perspective, industrial policy concept...

- Element of a **digitalisation process** affecting all areas of life
  - Not a linear development, but a **long transition period** with vehicles of different degrees of automation on public roads.
  - Part of a comprehensive (disruptive) **transformation process** (technologies, market development, social acceptance, legal framework, (urban) mobility policy,...)

- Technology potentially helping to **meet transport goals** effectively (and sustainably)
  - can increase transport demand, or
  - become basis for a fundamental change in urban mobility
  - if we can shape the political framework conditions accordingly
What we do not know about automation.

• Which **expectations for implementation** in cities are realistic in the current hype (availability, functions, safety)?
• What is the **timeframe** for implementation? (level 5 sharing systems are still far away, but level 4 public transport with adjusted infrastructure is possible).
• What are (connected) **infrastructure requirements**?
• How can we organise the (long and messy?) **transition period**?
• What is the impact in vehicle kilometres: increase or decrease?
• **Result of uncertainties → CAVs** are not mentioned in transport plans/ SUMP(s) or other strategic transport planning documents
Example: The major goals of urban transport policy of German cities...

Key transport policy goals

- Promote cycling & walking
  - 17 respondents
- Better public transport
  - 12 respondents
- Less congestion, reduced travel times
  - 11 respondents
- Energy saving, lower emissions, better air quality
  - 11 respondents
- Shift to sustainable modes
  - 11 respondents
- Better safety
  - 10 respondents

N=21; max 5 responses per participant

Expected automation impact

- Negative
- Negative
- Neutral
- Neutral
- Negative
- Positive

...and the (limited) contribution of automation!

Source: Hasse/Heinrichs - Digital mobil in Deutschlands Städten (2017)
What will remain uncertain for some time?

- impact of **new technological developments**, especially artificial intelligence, deep learning
- results of **field tests** (e.g. safety, efficiency)
- **acceptance** of new business models (e.g. sharing, costs, psychological factors)
- development of **legal framework** conditions (especially in urban areas)
- **social acceptance** of digitalisation
The basic scenarios

Automated Private vehicles
- Continuous development of driver assistance systems (SAE Level 2 - 4)
- Modal shift to automated private vehicles
- Increase in VMT

Automated, shared vehicles
- SAE Level 4 - 5
- Vehicles available on demand
- Empty trips to relocate
- Decrease in privately owned vehicles

Automated public transport
- SAE Level 4 - 5
- Automated feeder systems for public transport core network
- More attractive public transport
CoEXist in brief

- **Programme:** EU H2020-ART05
- **Duration:** May 2017 – April 2020
- **Total Budget:** 3,474,065 €
- **Strategic Aim:**
  - To bridge the gap between automated vehicles (AVs) technology and transportation and infrastructure planning by strengthening the capacities of urban road authorities and cities to plan for the integration of AVs on the same network.
- **Partners:**
  - 16 partners from 7 European countries (Belgium, France, Italy, Germany, Netherlands, Sweden and UK).
CoEXist

Approach

Automation-ready transport modelling: Validated extension of existing microscopic and macroscopic transport models to include different types of CAVs (passenger car/light-freight vehicle, automation levels).

Automation-ready road infrastructure: Tool to assess the impact of CAVs on safety, traffic efficiency and space demand. Design guidance for hybrid (CAV-/CV-shared) infrastructure.

Automation-ready road authorities: Elaboration of eight use cases (Gothenburg, Helmond, Milton Keynes and Stuttgart), used to evaluate CAV impacts on safety, traffic efficiency and road space requirements (with CoEXist tools) and making detailed hybrid infrastructure design recommendations.
"Automation-Ready Framework"

Transport **planning framework** for introducing CAVs:
- a **vision** and **definition** for automation-readiness during transition period
- traffic modelling and impact **assessment tools**
- **recommendations** for infrastructure and policy development (part of mobility plans/ SUMP) 
- **action plans** for transport authorities

**First version** currently in development, based on stakeholder contributions.

Source: Smith et al, 2015
Automation-ready Modelling: CAV-Driver Behaviour

Cooperation:

Maneuver planning: driver accelerates during lane changing
Automation-Ready Infrastructure

• Develop of **performance metrics** for assessment of CAV-readiness with respect to
  - safety
  - traffic performance
  - infrastructure space efficiency

• Develop combined metrics and thresholds/criteria for assessment of CAV-readiness

• **Implement performance metrics** and criteria in an impact assessment tool which use traffic model output as input

• **Discuss CAV-readiness** in the infrastructure/road design perspective → Automation-ready design guide
CoEXist Use Cases

Gothenburg (VTI)

Helmond (TASS)

Legend:
- Microscopic
- Macroscopic

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Shared Space

Accessibility during long-term construction works

Transition from interurban highway to arterial

Signalised intersection including pedestrians and cyclists

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CoEXist Use Cases

Legend:

Microscopic

Macroscopic

Impact of driverless car- and ridesharing services

Waiting and drop-off areas for passengers

Loading and unloading areas for freight

Milton Keynes (University of Cambridge)

Stuttgart (University of Stuttgart)

Impacts of CAVs on travel time and mode choice on a network level
Automation-Ready Local Authorities

CoEXist Automation-Ready framework

• Guidance on technology, analysis methods, impacts and measures
• Clear-headed and informed decisions about automation
• Automation FAQ for cities

Automation-ready action plans:

• Bottom-up local stakeholder process – Automation-ready Fora
• Action Plan: Now, 5 years, 10 years
• Annex to strategic transport plans (e.g. SUMP's)
Measures to promote sustainable automation (1)

- Measures in **next 5 years** ("Automation Awareness")
  - **inform stakeholders** about technologies, potentials and risks of automation
  - develop high level CAV **scenario and vision**
  - estimate **potential contribution** of "driverless vehicles" to **achieve city goals**
  - establish **communication/ cooperation** with other actors interested in automation, incl. ‘**non-traditional’ actors** (e.g. vehicle manufacturers)
  - plan/ implement **pilot measures** and tests
  - support open **data exchange**
  - **massively promote sharing, public transport, non-motorised transport** ("new mobility culture")
Measures to promote sustainable automation (2)

Medium-term measures: 5 - 10 years ("Automation Strategy Formulation")

• update of **transport model** (demand model), formulate and modell scenarios

• initiate innovations:
  – qualify **employees**
  – make **synergies concrete** (public transport, freight transport/city logistics, energy sector, municipal services, e.g. waste collection)

• **infrastructure** planning
  – evaluate **capacity requirements** of traffic routes, technical infrastructures (e.g. C-ITS) and vehicle fleets
  – consider **maintenance, resilience, liability** requirements

• management/ reorganisation of **public space**
  – secondary impacts of automated corridors
  – road space/ kerb space, parking areas, distribution of goods, delivery, mobility hubs

• formulate **integrated concepts** for collective, automated, electric (and inclusive) mobility

• **pilot trials** - pragmatic, small steps, systematically building critical mass, expectation management, business case, data management
Measures to promote sustainable automation (3)

Long-term measures: 10 - 20 years ("Automation Implementation")

- institutional adjustments (e.g. "MaaS agency")
- infrastructure adjustments (e.g. road markings, speed limits)
- (re-)building collective mobility services
- tenders for automated fleets
- specific policy measures for automated services, e.g. pricing of empty runs
Conclusions (1)

Our cities have many opportunities to use automation as a tool to fundamentally change urban mobility – starting now. An "automation-ready" transport policy should be the basis for infrastructure planning and deployment.

• Lack of a policy framework will create inefficiencies and frustration.
• Automation needs to be defined from a policy perspective, and not from an SAE automation level perspective.
• A common vision for automation and goals should identify expectations.
• Policy development should be based on analyses and supported by all stakeholders.
Conclusions (2)

We should look at automation as an element of a more fundamental change process

- technological developments,
- economic, social, political and cultural game changers.

Planning decisions require caution due to high level of uncertainties (e.g. behavioural and regulatory responses to automated vehicle deployment)

In addition to (old and new) risks, new opportunities for sustainable urban development arise.

Local actors should actively use these opportunities and become "automation-ready".
Conclusions (3) – "SUMP 2.0"

• The SUMP principles are also **applicable to automation** – we do not have to re-invent the wheel!
• CoEXist will provide **automation planning tools** (models, infrastructure and experience from use cases).
• CoEXist can set the ground for an **“automation extension”** of SUMP (significantly more work is required in the longer term).
• Coordination of SUMP guidance development **across ITS fields** would be beneficial (common stakeholders, business models, technologies etc.)
Thank you for listening!

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