CoEXist

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Introduction to Connected and Automated Driving (CAD) in Cities

How can cities prepare for CAD?

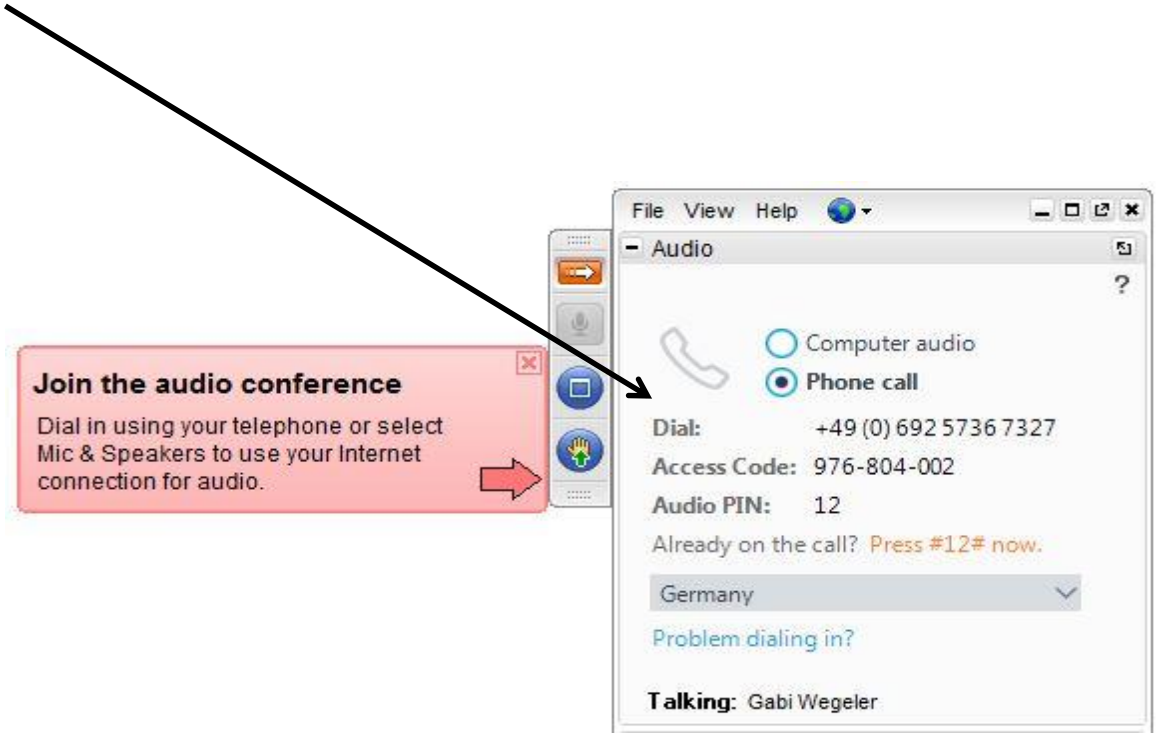
Monday, 26 February 2018
12:00 – 13:30

Moderator:

Siegfried Rupprecht
Executive Director, Rupprecht Consult

Phone or internet connection

Dial-in options



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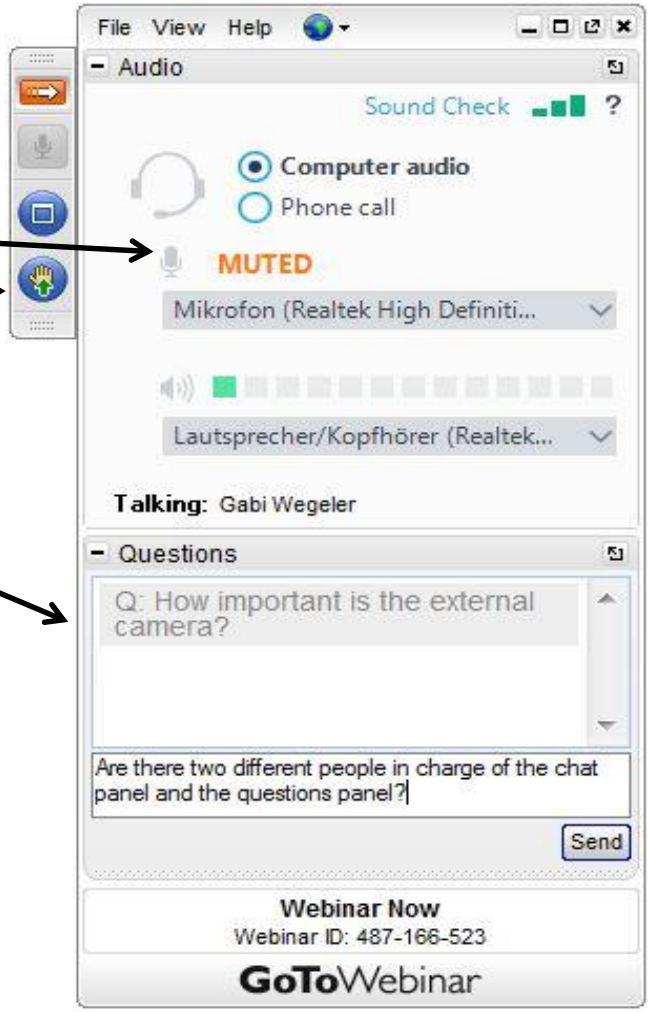
Participation tools

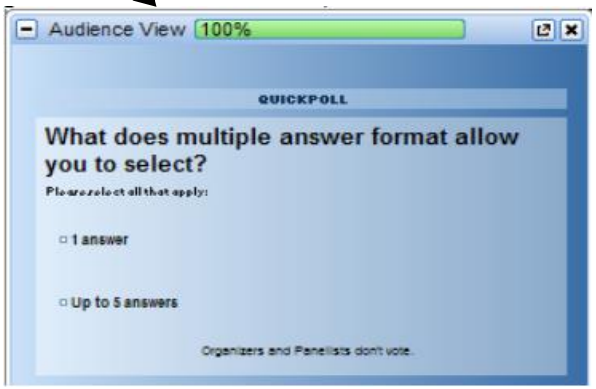
Mute

Raise your hand

Questions

Polls





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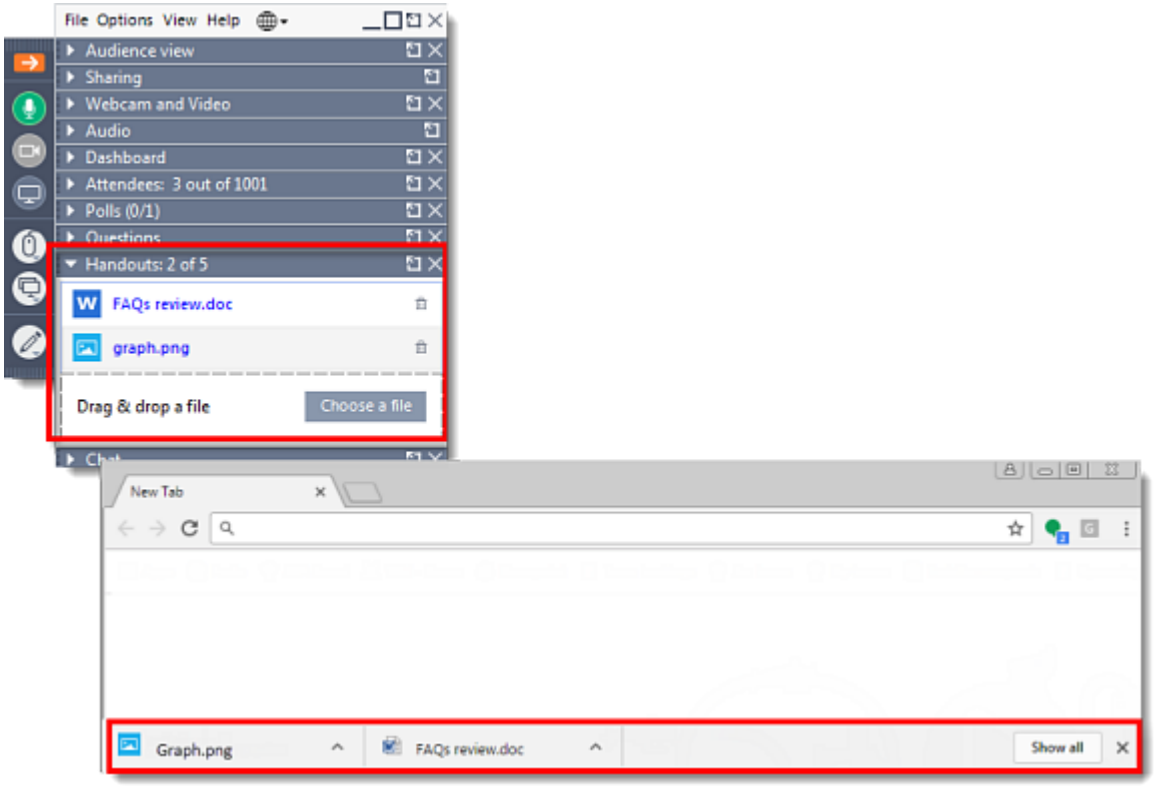
Download handouts



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The webinar team

Question and poll manager:

Syrus Gomari

Technology manager:

Daniel Franco

Moderator:

Siegfried Rupprecht

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Presenters

Bernard Gyergyay
Rupprecht Consult

Brian Matthews
Milton Keynes Council

Adriano Alessandrini
University of Florence

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Webinar Structure

12:00 – 12:15	Introduction
12:15 – 12:35	Automation: how far are we? How can we start preparing?
12:35 – 12:55	How a mid-size city is preparing for CAD? The case of Milton Keynes, UK
12:55 – 13:15	What is the role of automation in public transport?
13:15 – 13:25	Open discussion
13:25 – 13:30	Wrap-up

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Instructions for questions

- Use the question box feature at anytime and the question manager checks it and forwards the question
- Short Q&A (3-5 minutes) after each presentation
- There will be a 10-15 minute open discussion and questions at the end of webinar

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Poll question 1

What is your profession and background?

- Urban transport planner in public authority
- Consultant/ Adviser
- Public transport operator/ mobility service provider
- Research institution/ University/ Recent graduate
- Other (e.g. technology companies, OEMs, etc.)

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Poll question 2

Are you familiar with CIVITAS or have attended a CIVITAS conference?

- Yes
- No

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Expectations (and myths) about Automated Driving in cities

+ S… for **ageing** driv…
+ Mobility s… for **low-demand** a…
+ **Cost** saving in Publi… Transport
+ Boost for **sh…** mobilit…
+ I… **safety**
+ Better use of urban **space**

– Unclear impacts in **cities**
– More **d…** in… obility
– … traffic, more **congestion**
– … **security** issu…
– Urban **spr…**
– Unresolved **eth…** questions

many u… what can cities do? …tainties!

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This webinar

- Aims:
  - contribute to an **informed debate** about automation
  - start discussion what **urban mobility stakeholders** can do
  - help cities **prepare policies**.
- Today's agenda
  - **introduction** to automation
  - example of a **mid-sized city** preparing for automation
  - role of automation in **public transport**
- … to be continued?

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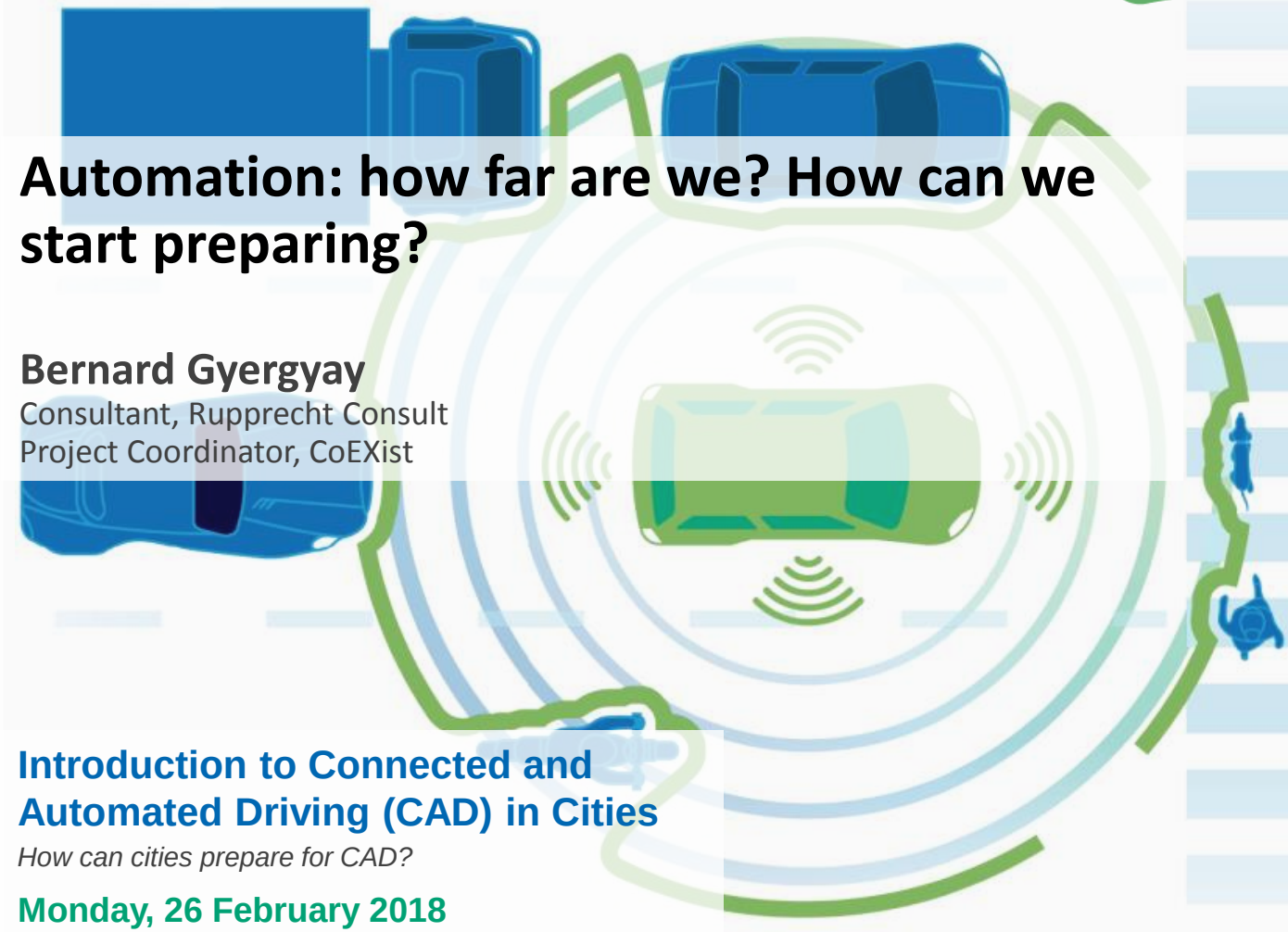

Automation: how far are we? How can we start preparing?

Bernard Gyergyay
Consultant, Rupprecht Consult
Project Coordinator, CoEXist

Introduction to Connected and Automated Driving (CAD) in Cities

How can cities prepare for CAD?

Monday, 26 February 2018
12:00 – 13:30

Agenda

- Technology and Terminology
- Uncertainties for CIVITAS cities
- Concept of ‘Automation-Readiness’
- ‘Automation-Ready’ Measures and Policies

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Poll question 3

How would you rate your knowledge on urban transport automation?

- 1 – beginner
- 2
- 3
- 4
- 5 – expert

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The public image of automation

Shared vehicles

Private Vehicles

Which type of vehicle will you see first on your road network?

C-ITS, V2V, V2I & V2X

Human-in-the-loop Automation

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Terminologies

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

Full Automation

0	1	2	3	4	5
No Automation	**Driver Assistance**	**Partial Automation**	**Conditional Automation**	**High Automation**	**Full Automation**
Zero autonomy; the driver performs all driving tasks.	Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.	Vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times.	Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.	The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.	The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

<u>SAE levels in the urban transport context</u>

- Need to be understood in the context of an ‘Operational Design Domain’:
  - A vehicle today can achieve SAE level 4 in the right ODD, but this might require significant changes to the physical and digital road infrastructure.
- SAE levels are **not as relevant** for urban transport planning as many think:
  - SAE describes the interaction between the “driver/passenger” and the AV, but it does not describe the ‘**operational purpose**’ of the vehicle.

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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
- Automated feeder systems for public transport core network
- More attractive public transport

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Poll question 4

When do you think will connected and automated driving (CAD) become widespread in your city?

- 0-5 years
- 6-10 years
- 11-20 years
- 21-30 years
- 31++ years

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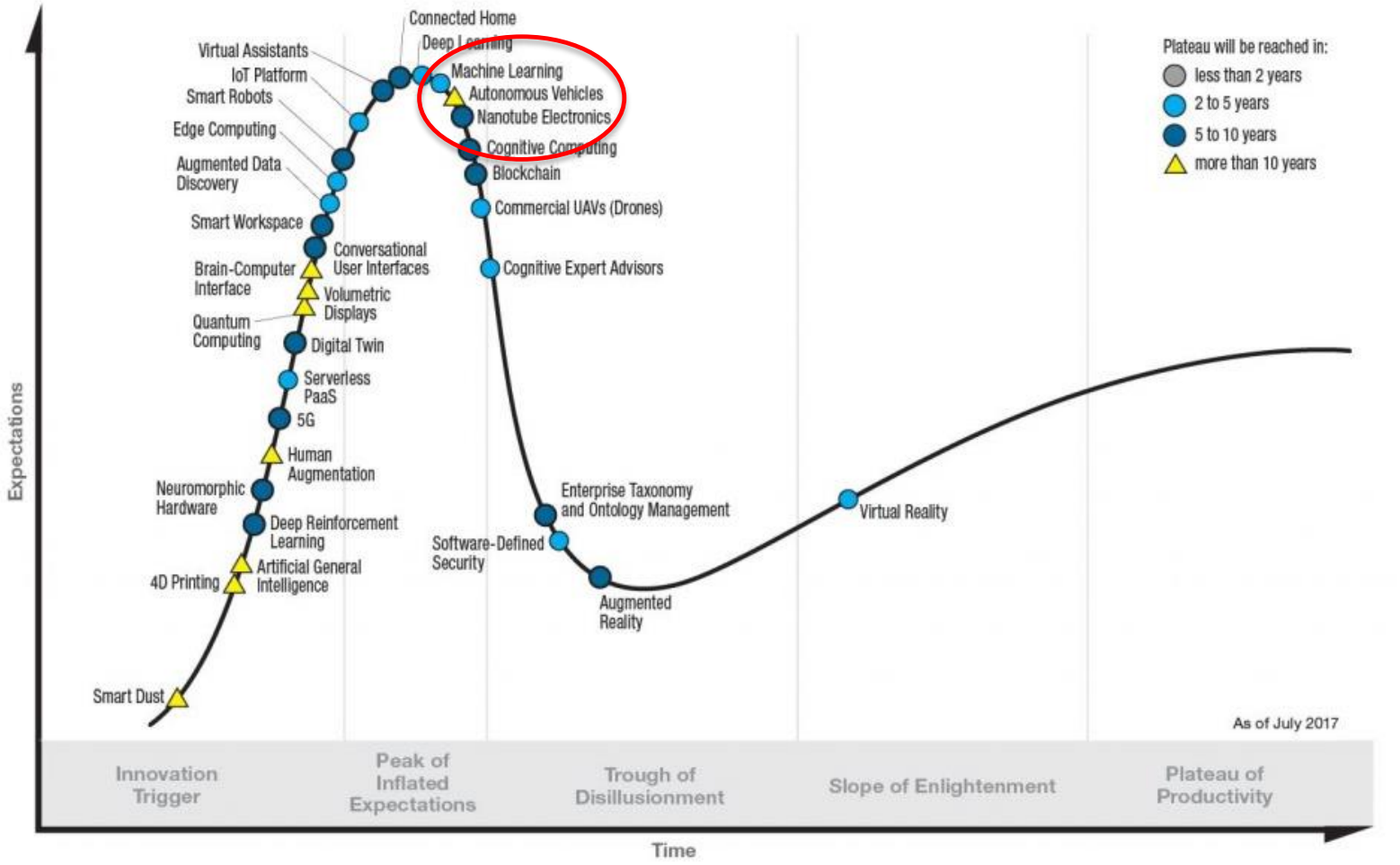
Gartner Hype Cycle for Emerging Technologies, 2017



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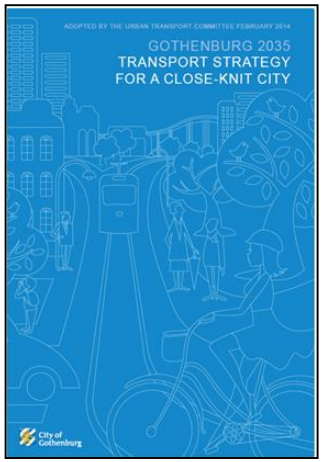
Uncertainties for cities

- 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 impacts in vehicle kilometres: increase or decrease?
- **Result of uncertainties → CAVs are not mentioned in transport plans/ SUMPs or other strategic transport planning documents**



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Poll question 5

Within your city's sustainable urban mobility plans (SUMPs), how much detail is included in preparing for CADs?

- Not at all/ I do not know
- Acknowledgement, no detail
- Some inclusion, with limited detail
- High degree, with detail

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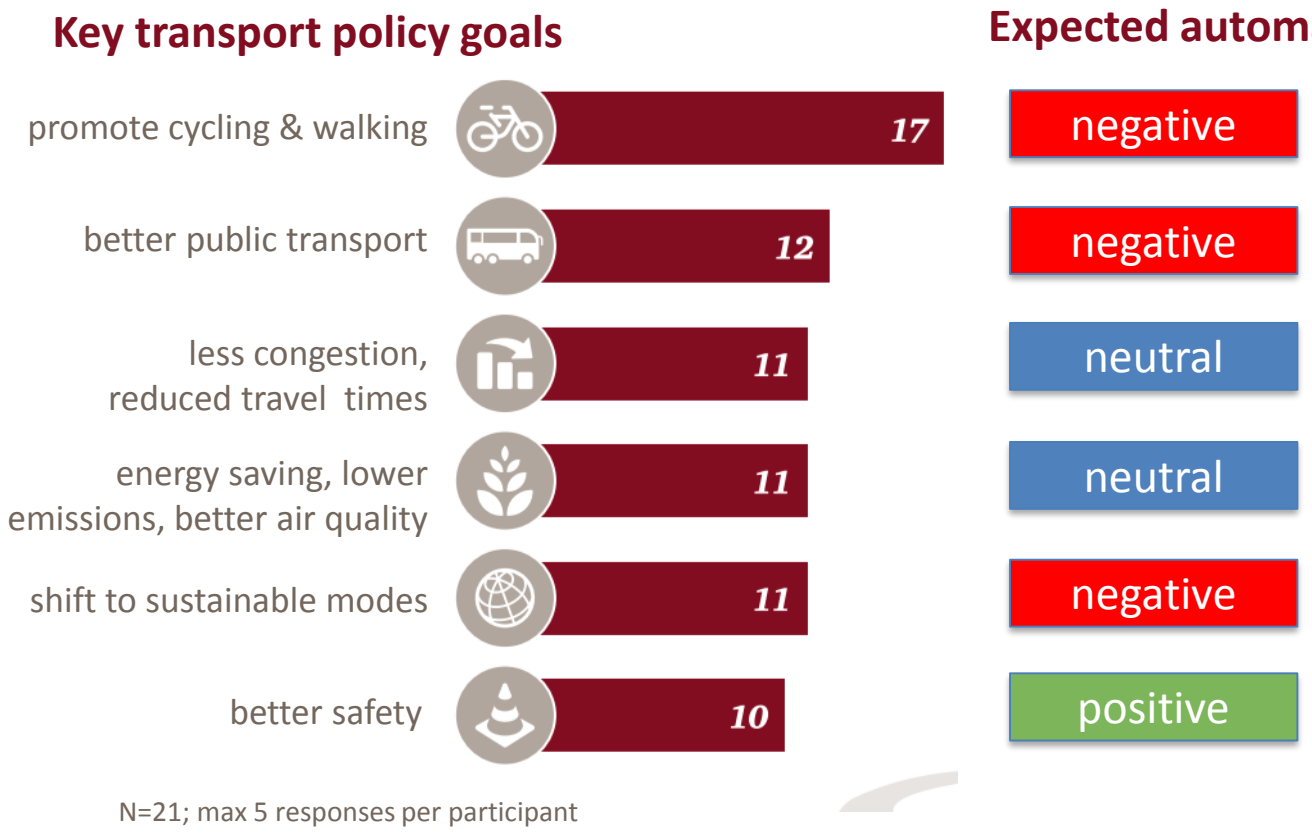
Example: The major goals of urban transport policy of German cities…



Source: Hasse/ Heinrichs - Digital mobil in Deutschlands Städten (2017)

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Poll question 6

Do you think automation supports your city's mobility and sustainability goals?

- No, it is against some of our goals
- No, the disadvantages outweigh the benefits
- Yes, but only in specific contexts
- Yes, it supports all our goals
- Uncertain/ too early to say

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Project Facts

- Programme: EU **Horizon 2020** (ART 05)
- Duration: **May 2017 – April 2020**
- Total Budget: **3,474,065 €**
- **15 partners** from **6 European countries**
- Strategic Misson:

  To systematically increase the capacity of European local authorities and other urban mobility stakeholders **to get ready for the transition** towards a shared road network with increasing penetration rates of CAVs

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Definition for “Automation-Readiness”

- Our current definition:

  “Automation-ready is defined as conducting transport and infrastructure **planning for automated vehicles in the same comprehensive manner as for existing modes** such as conventional vehicles, public transport, pedestrians and cyclists, while ensuring **continued support for existing modes and higher level mobility goals**.”

- Specific **modes** may require adapted definitions.
- Definitions will have to be modified **over time**.
- Today, cities don’t have to be **“automation-ready”**, but **“automation-aware”**.

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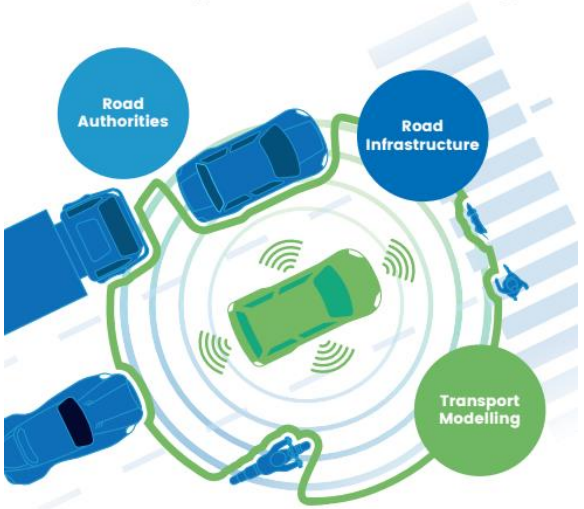
CoEXist Approach

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) with **automation-ready action plans**.



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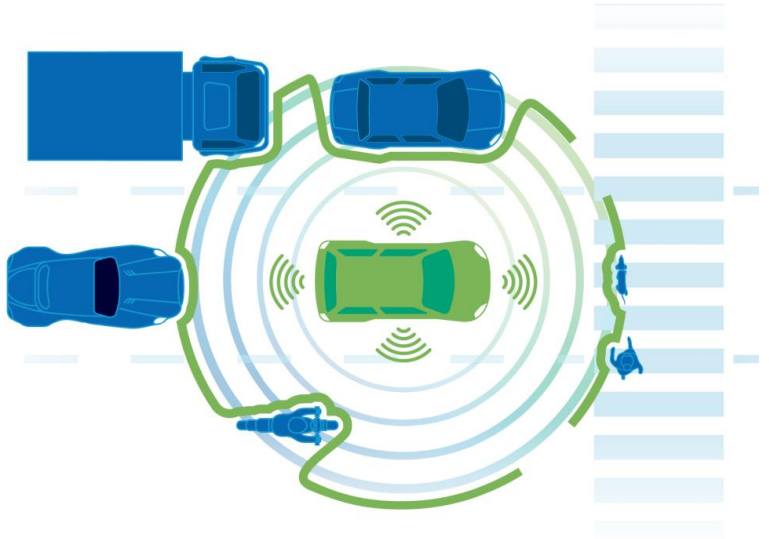
Automation-Ready Local Authorities

CoEXist Automation-Ready framework

- Guidance on issues like technology, impacts and measures
- Clear-headed and informed decisions about automation
- Automation FAQ for cities
- **First version** currently in development



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. SUMPs)

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"Automation Awareness“ Measures in next 5 years

- Measures in **next 5 years ("Automation Awareness")**
  - **inform stakeholders** about technologies and potential/risks of automation
  - estimate **potential contribution** of "driverless vehicles" to achieve city goals
  - establish **communication/ cooperation** with other actors interested in automation (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")

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Automation Strategy Formulation
Medium-term measures: 5 - 10 years

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, parking space, 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

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Automation Implementation
Long-term measures: 10 - 20 years

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 PT fleets
- specific **policy measures** for automated services, e. g. pricing of empty runs

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Conclusions

An (automation-ready) **transport policy** should be the basis for infrastructure planning and deployment.

- Cities can act now, automation awareness
- Lack of a policy framework will create inefficiencies and frustration.
- Automation needs to be defined from a policy perspective, and not from an SAE perspective.
- A **common vision** for automation and goals should identify expectations.
- Policy development should be **based on analyses** and supported by all **stakeholders**.

These projects have received funding from the European Union

Thank you for listening!

Bernard Gyergyay

b.gyergyay@rupprecht-consult.eu

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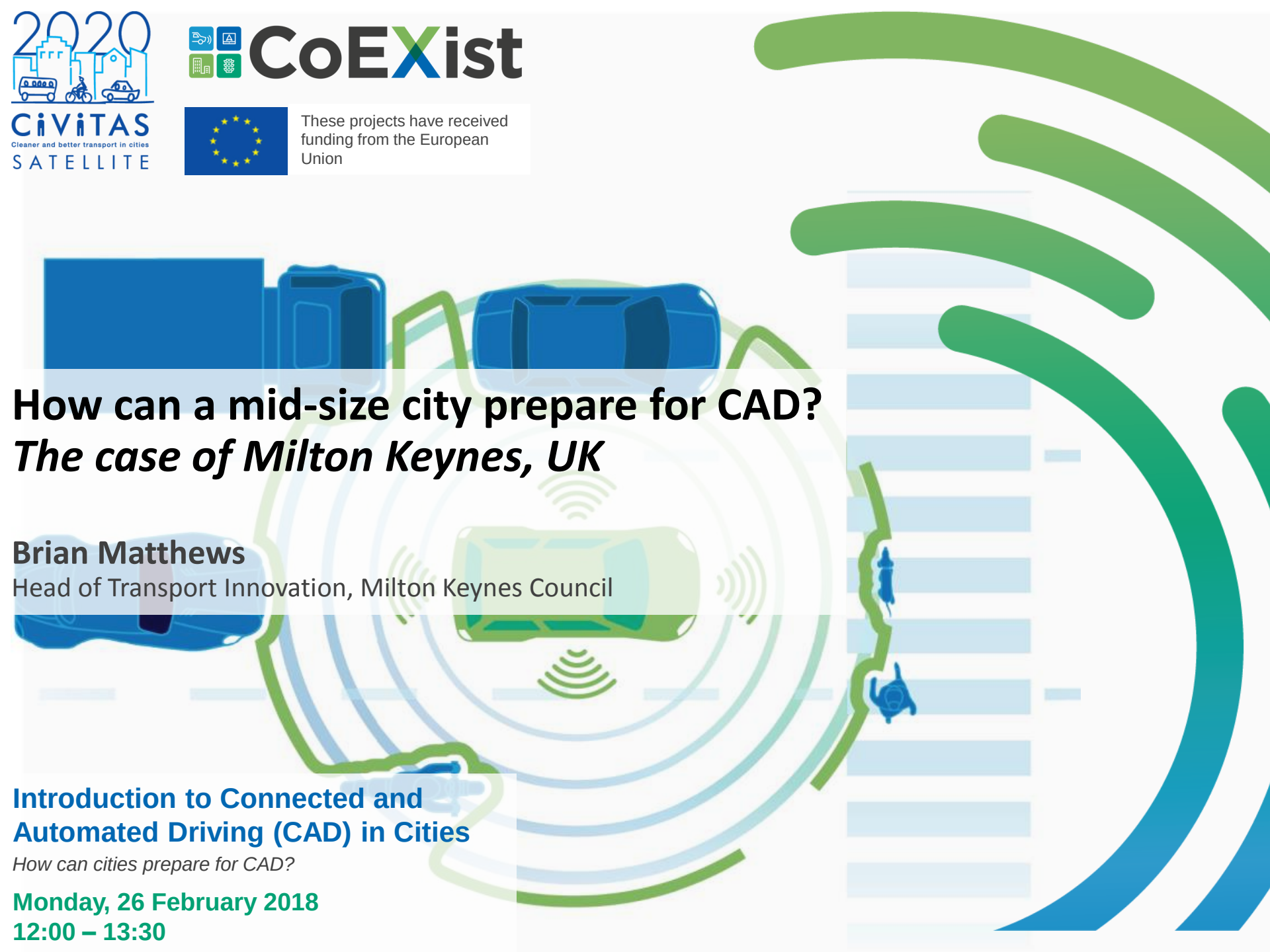


How can a mid-size city prepare for CAD?
The case of Milton Keynes, UK

Brian Matthews
Head of Transport Innovation, Milton Keynes Council

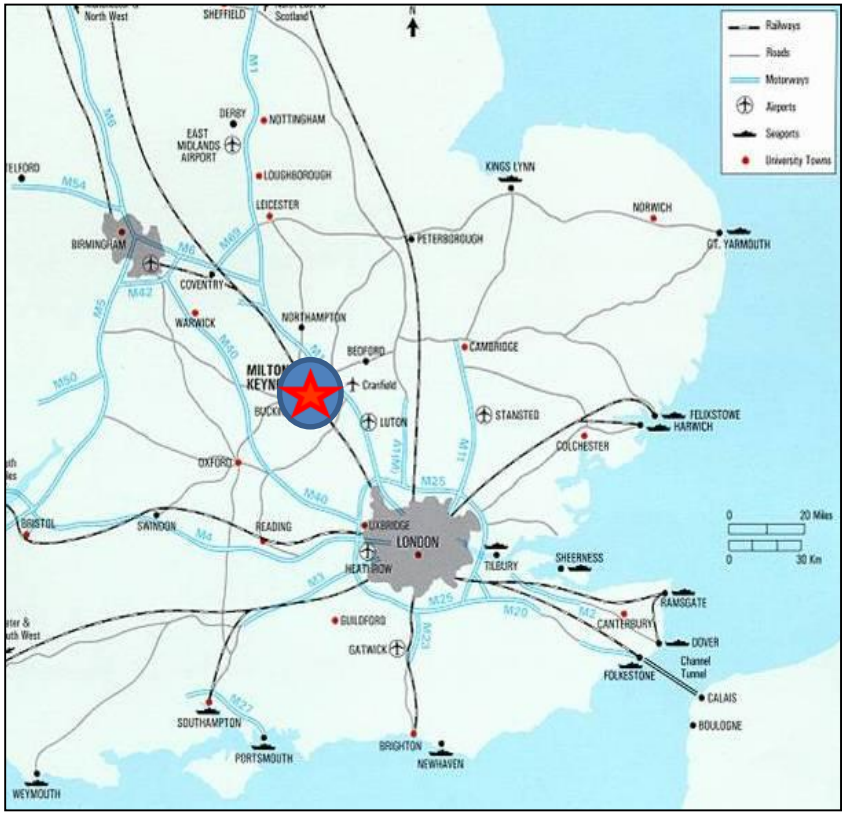
Introduction to Connected and Automated Driving (CAD) in Cities

How can cities prepare for CAD?

Monday, 26 February 2018
12:00 – 13:30

Milton Keynes - Location

- New Town started in 1967
- Midway between London & Birmingham and Oxford & Cambridge.
- Well connected to national transport networks
- Centre of new Oxford – Cambridge Arc



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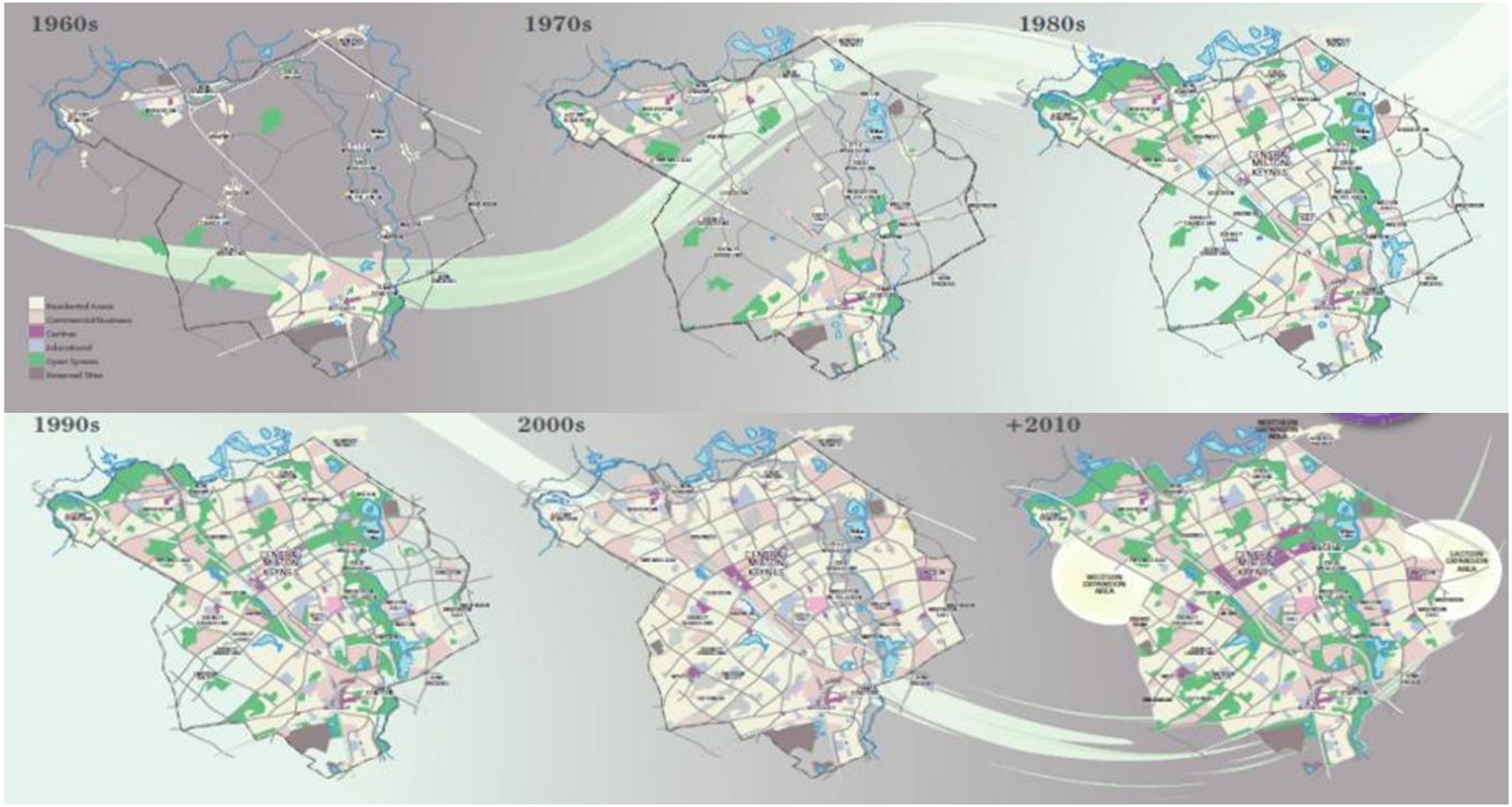
Rapid and Sustained growth



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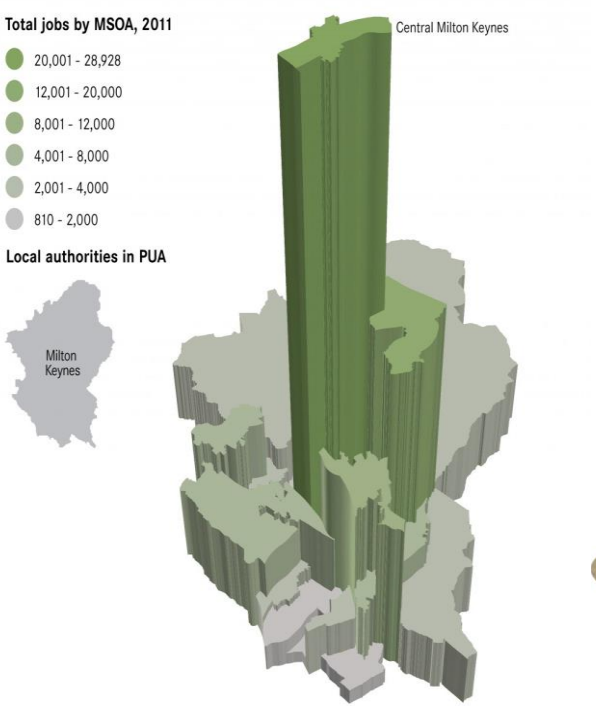
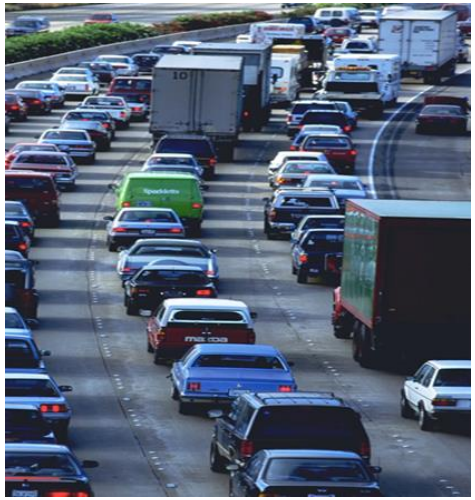
Challenge?





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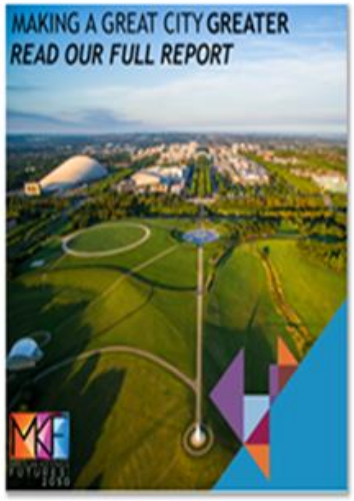
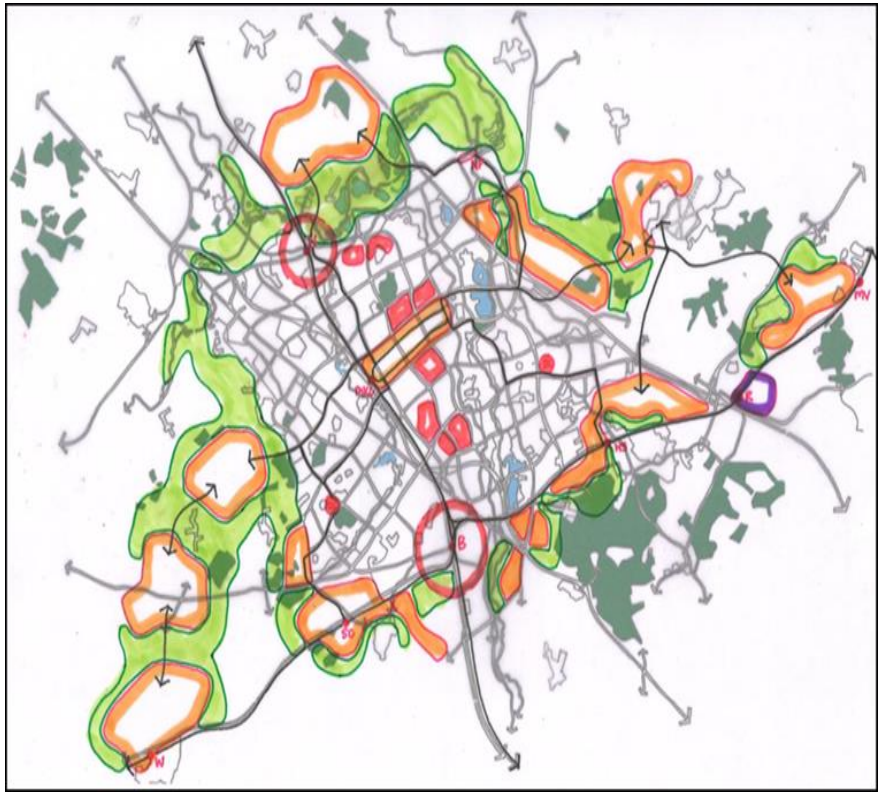
MK Futures – 2050
Making a Great City Greater

MK Futures 2050 Commission: "Making a Great City Greater"

- Vision for **Inclusive Growth** to around 400,000 people by 2050
- Recommended:
  - **Strategy for 2050**
  - **Six Big Projects** to address challenges facing the city over the coming decades
- Project 4: **smart, shared sustainable mobility**





Milton Keynes – 2050 development pattern?

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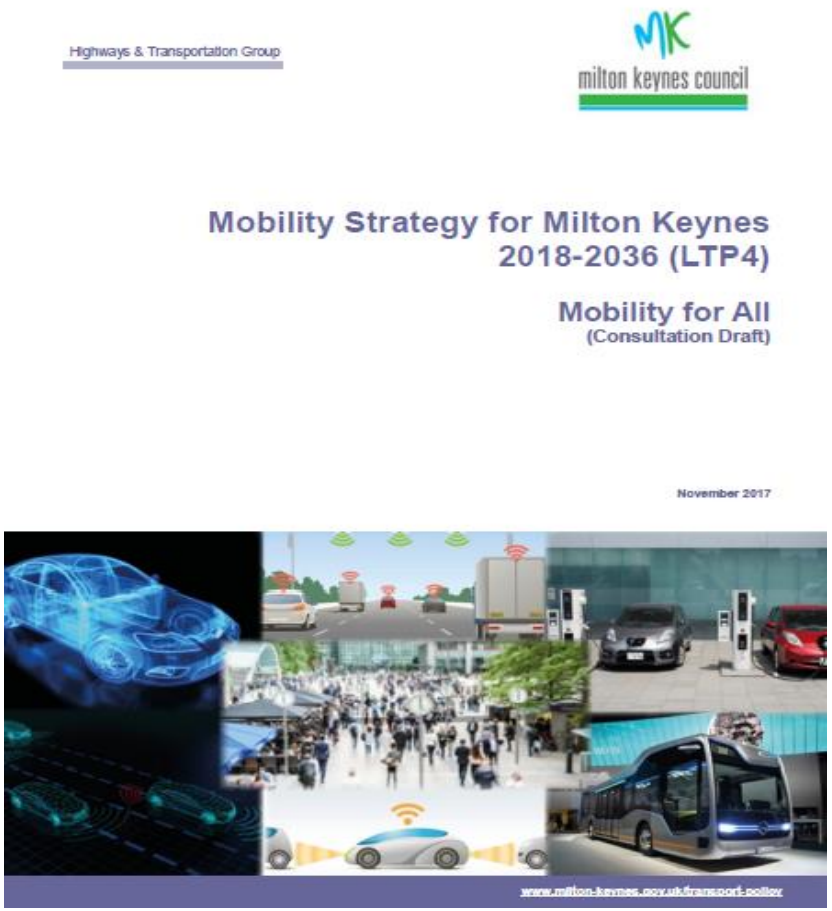
Refresh (Transport) Mobility Strategy



Emphasis

- Mobility for all
- Mobility as a Service concept
- Clear endorsement of using technology as a primary tool to support mobility
- Defines transition goals
- **<u>Introduces and develops business case for this</u>**

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Poll question 5

Within your city's sustainable urban mobility plans (SUMPs), how much detail is included in preparing for CADs?

- Not at all/ I do not know
- Acknowledgement, no detail
- Some inclusion, with limited detail
- High degree, with detail

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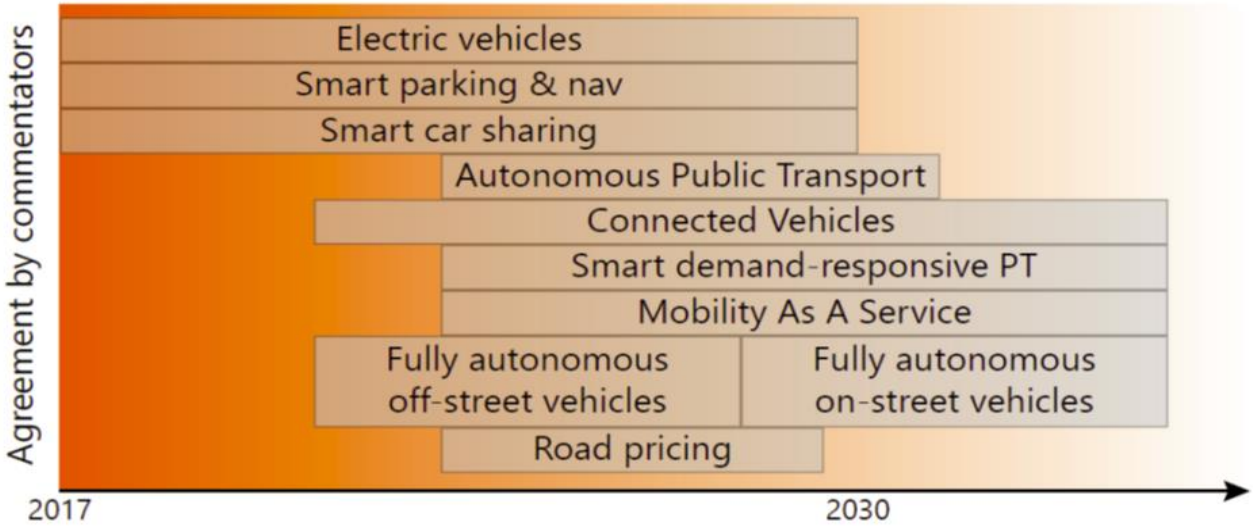
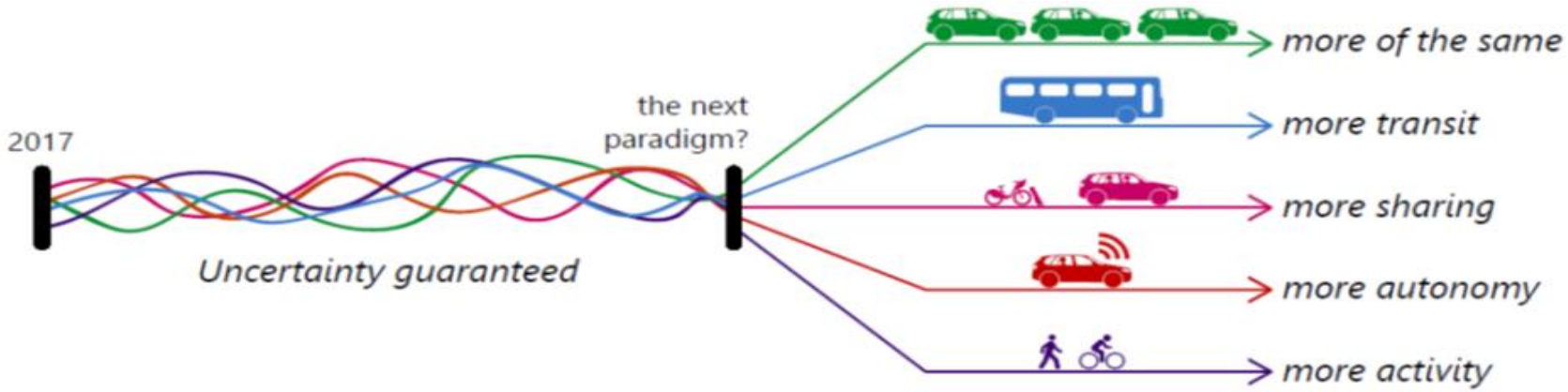
Project 4 :
Smart Sustainable Shared Mobility





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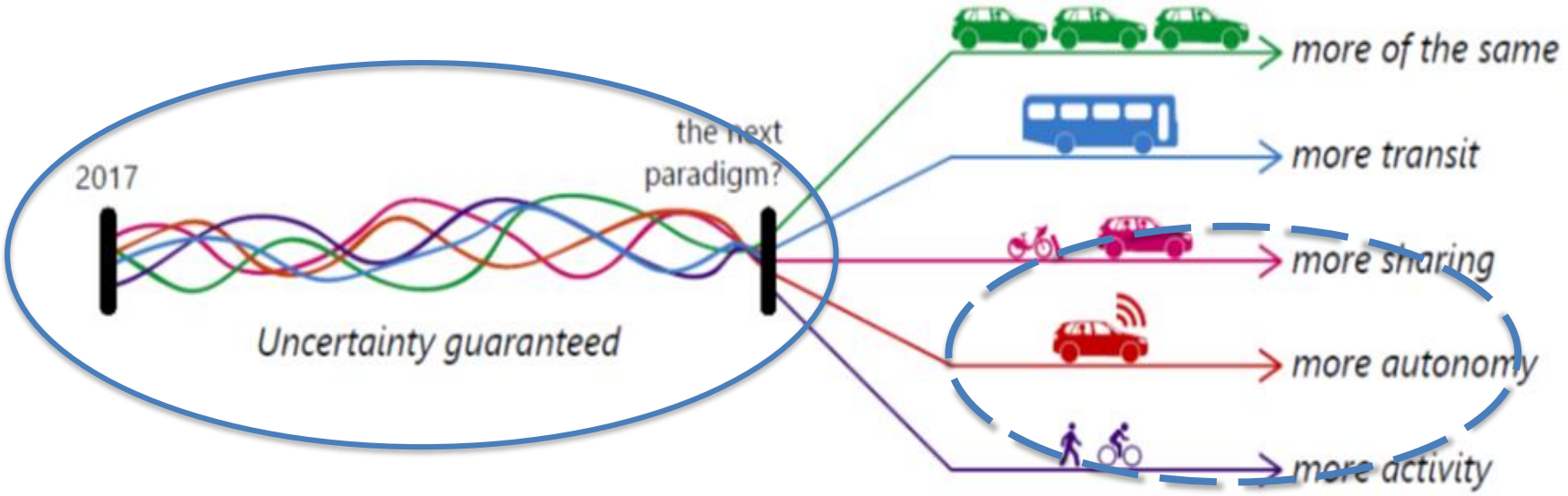
Project 4 :
Smart Sustainable Shared Mobility Roadmap



These projects have received funding from the European Union

UK Autodrive - Case Study

Milton Keynes leading the way in partnership with Coventry and the motor industry

These projects have received funding from the European Union

Leadership

Cities Programme

Lead Partners

- Milton Keynes Council

Supported by

- Cambridge University
- Oxford University

Primary Aim

To determine long term benefits and application of autonomous vehicles to the urban environment

These projects have received funding from the European Union

Setting the Agenda

Hypothesis

Connected & driverless cars could have a significant role, providing safe, efficient and low carbon mobility to the public

- **Safety**
- **Productivity**
- **Capacity**
- **Mobility**

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Key Questions specific to MK Strategy

- **In Milton Keynes**….
- In a future scenario of 100% AVs what would the impact be on congestion in the city?
- What if any would improvements in mobility would a first/ last mile low speed AV passenger transport system deliver?
- What is the likely business case for L-SATS?
- What is the public view and what is the direction of travel in opinion?

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Poll question 7

What do you think is/are the primary reason/s for developing CAD? (select all that apply)

- Improving safety
- Improving productivity
- Reducing congestion
- Increasing mobility options
- None of the above / other

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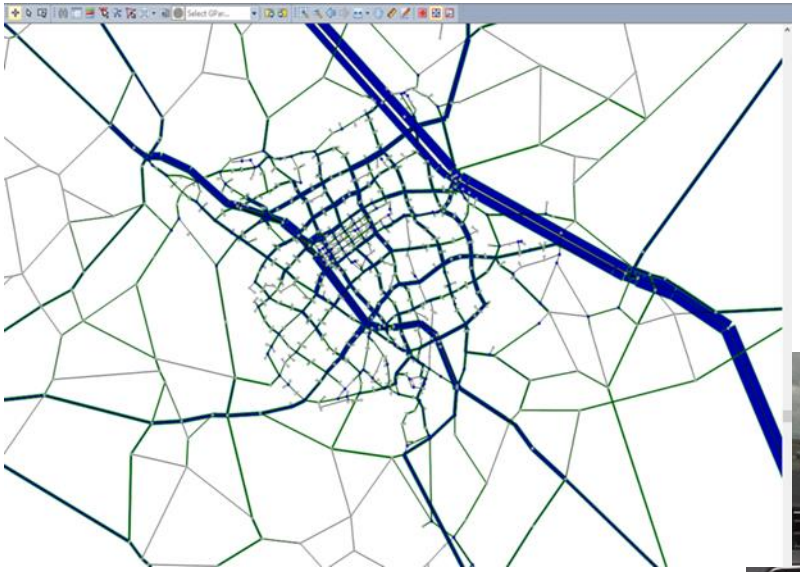
Can CAVs Improve capacity?



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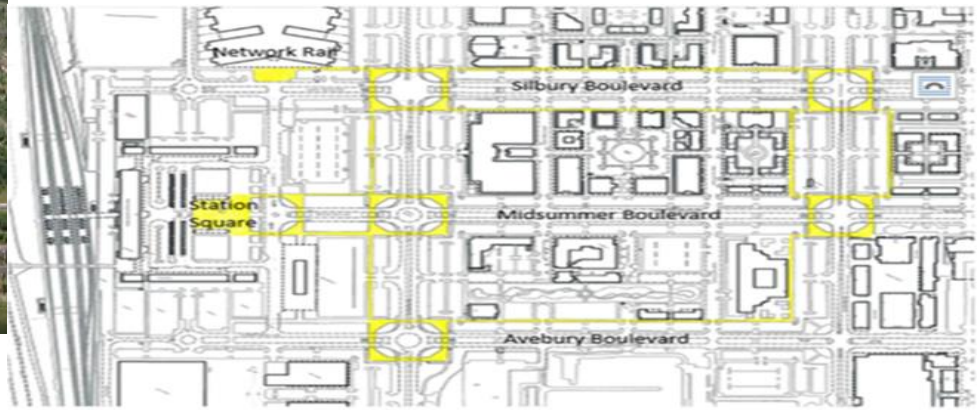
Practical Application

L-SATS

Can we demonstrate in a real place that Low-Speed Autonomous Transport System (PODS) can improve City Centre mobility



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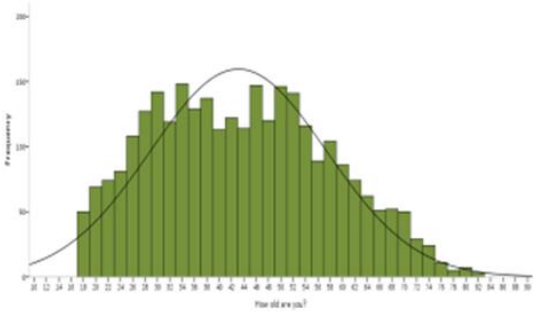
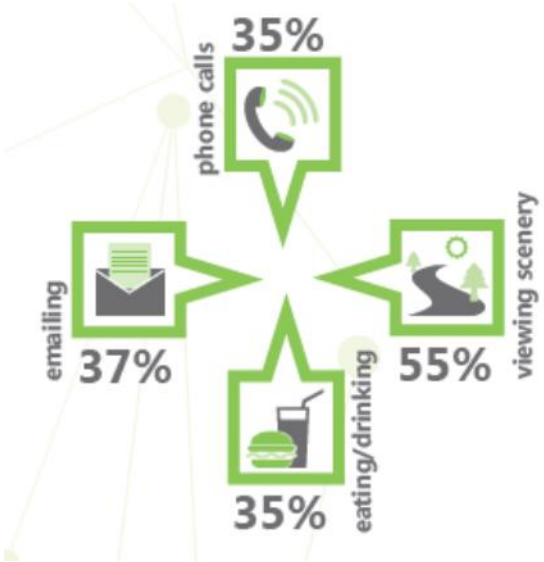
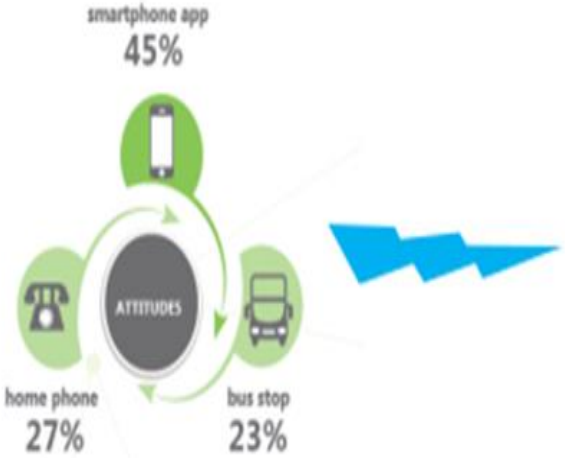
Working with the Public

October-November 2016
- 49 questions
- Over 3,000 responses
- 2850 valid responses







Full details
http://www.ukautodrive.com

Lessons Learned

- Technology is still in development, and in some areas not as mature as some would have you believe.
- Legal, regulatory and insurance issues are **very important,** but they should not be insurmountable barriers stopping you from moving forward
- We found insurers, and legal partners want to help – it is their future business model!
- Likewise car manufacturers want to work with cities to get a understanding of future markets.

These projects have received funding from the European Union

Considerations for other cities

- Take advantage of the positions cities have in driving the CAV agenda (framework) forward.
- Understand what you want to achieve, and articulate as a vision/plan – or demonstrate how it can accelerate current plans
- Collaboration is key – however it is often funding or business opportunities bring partners together
- Work with national bodies (Govt/Industry) to support local agenda, grasping current opportunities
- Take advantage of general support being shown from public.

These projects have received funding from the European Union

Summary

- City providing clarity and leadership in setting the agenda

- Actively exploring use of technology in mobility to ensure that the city can developed in line with short and long term vision.

- Plan making beginning to working at detailed level to enable deployment of technology

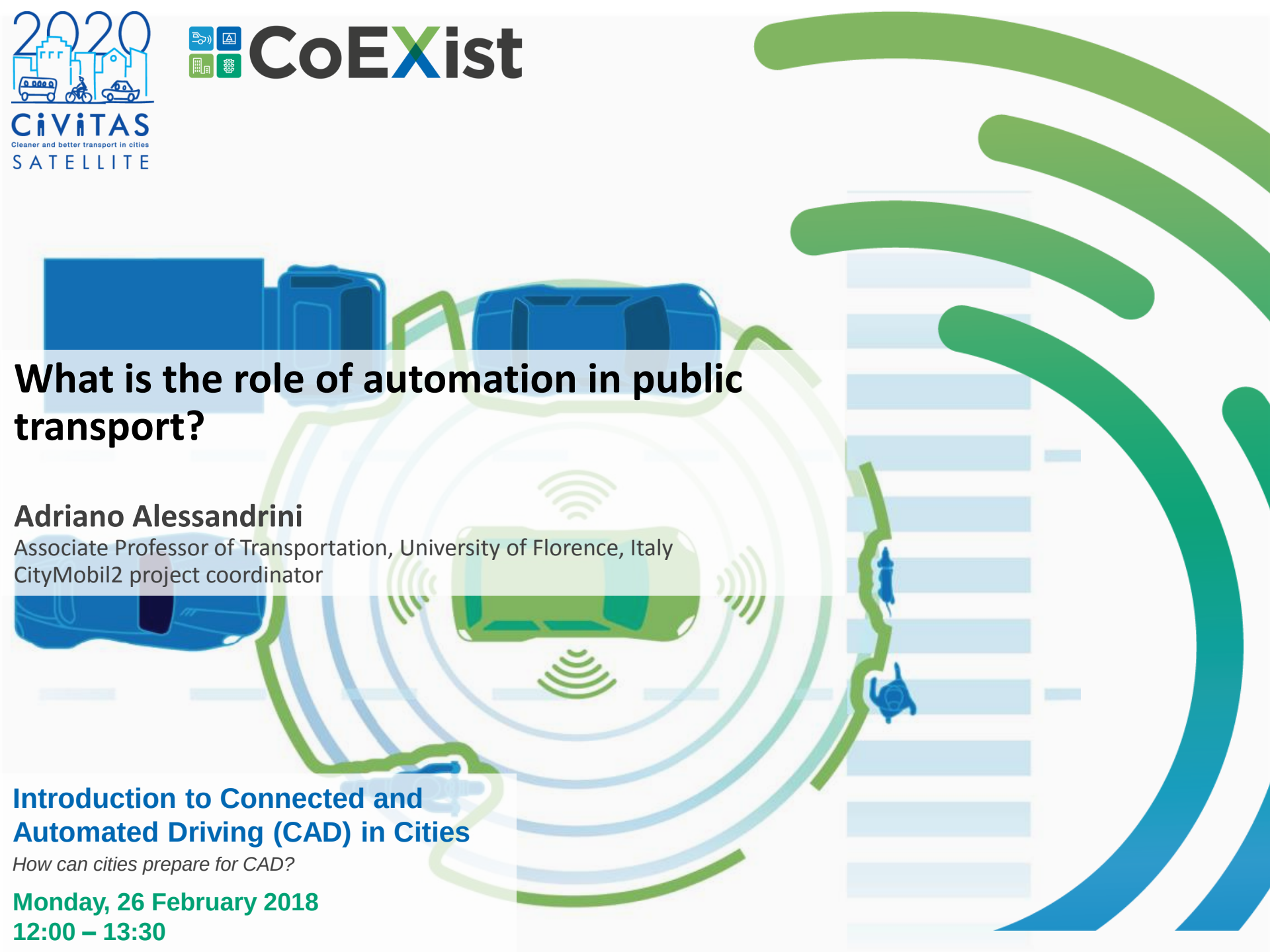
These projects have received funding from the European Union

Thank you for listening!

Brian Matthews

Brian.Matthews@Milton-Keynes.gov.uk

These projects have received funding from the European Union



What is the role of automation in public transport?

Adriano Alessandrini
Associate Professor of Transportation, University of Florence, Italy
CityMobil2 project coordinator

Introduction to Connected and Automated Driving (CAD) in Cities

How can cities prepare for CAD?

Monday, 26 February 2018
12:00 – 13:30

Poll question 8

How and where should automation FIRST be deployed to rip the most benefits?

- In privately owned vehicles
- Ride sharing (e.g. Uber) and vehicle sharing (e.g. car2go)
- Road-based public transport (e.g. buses, shuttles)
- None of the above/ other forms

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Poll question 9

How significant of an impact do you think automation could have on public transport (PT)?

- 1 - none: it will not change anything
- 2 - low: could support PT, but I'm not sure
- 3 - medium: could lead to new PT services
- 4 - high: will make PT more attractive compared to others
- 5 - significant: will transform PT as we know it

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Automation is ready for public transport and not yet for private one

- Door-to-door
- From anywhere to anywhere
- Using any infrastructure
- No supervision

- Multimodal
- On pre-selected routes
- Only on certified (adapted) infras
- Full supervision

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How does it translate in technical terms and why is PT readier

- Dealing with failures
  - Redundancy vs. fail safe
- Dealing with other users
  - Forecast user behavior vs. integrated safety assessment
- Dealing with external problems
  - Recognizing police and roadworks vs. communicating with the control room

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First and last mile services, lessons learned from CityMobil2

- In CityMobil2 we transported more than 60 thousand passengers on low-speed last mile shuttles on shared urban street
- We learned that:
  - Technically PT automation it is feasible
  - It is safe ONLY if designed so with a thorough urban integration study
  - Speed is crucial for everything from customer satisfaction to financial appraisal
  - Though we enable services in “low demand areas” ridership is crucial to the service success

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What does it mean to have certified infrastructures?

- The example of a street in Delft conceived for road safety but perfectly responding to the safety criteria of automated road transport

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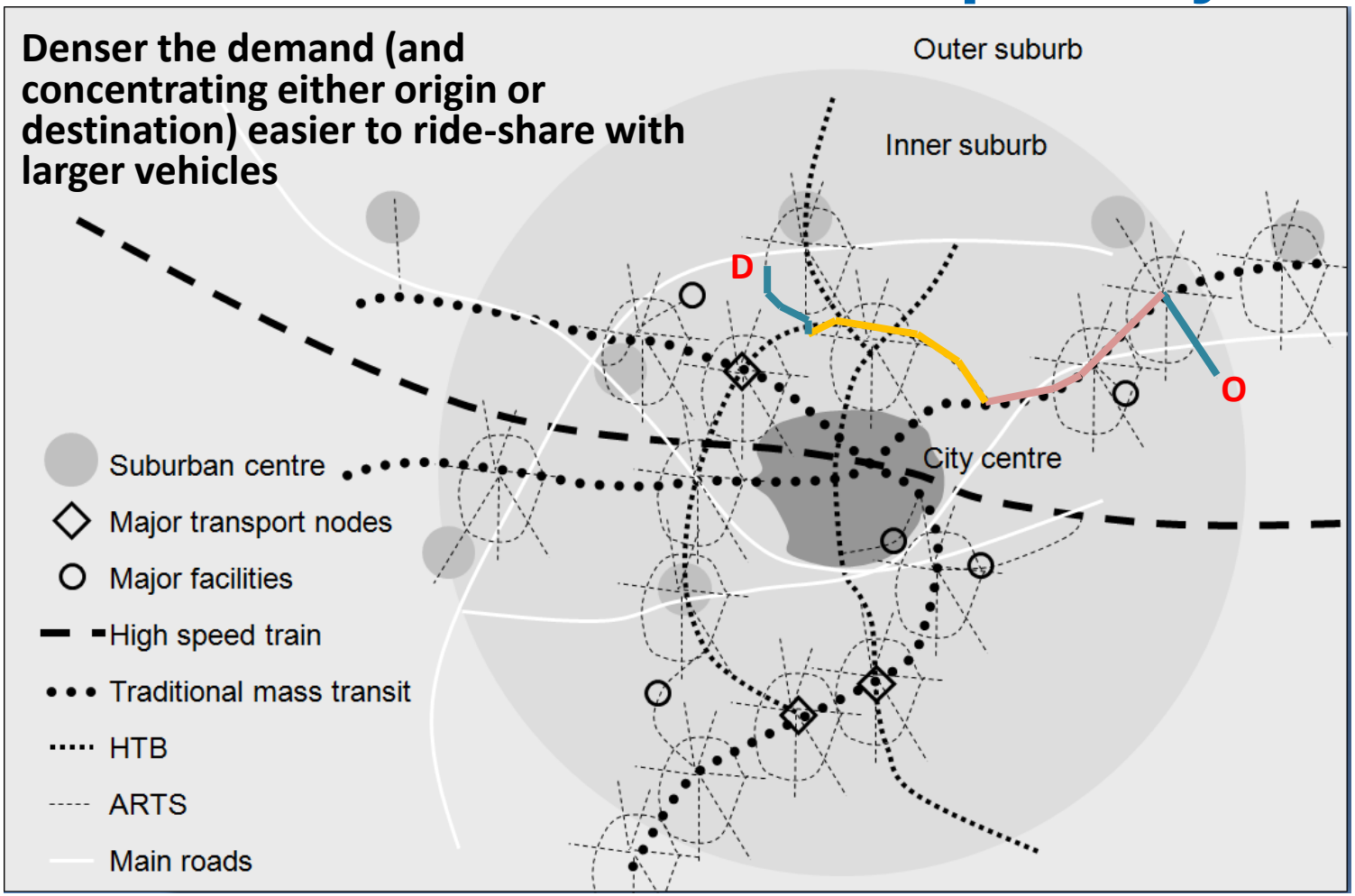
The main problems of Public Transport and how automation can help today



Which services first

- Ride-shared cars to the train stations in the cities' outskirts to be relocated empty using either automation or platooning (depending on the local legal framework)
- Small (30 places) electric busses to operate on demand for the last mile (with a driver if legally necessary) and then platooned at high speed (70km/h) on high capacity corridors.
- And both services can be provided retrofitting existing vehicles with very limited or no investments at all

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Conclusions

- Automation is here to stay … and it will be disruptive
- The existing business models for cities, transit operators and car makers will cease to exist
- A new blurred ride services will replace them all.
- If cities and transport operators move now they will have 5-7 years to shape the future pushing shared transport and city livability
- If they let car makers have their way they will provide in 5-10 years A-taxi services all over destroying public transport and clogging cities with congestion and pollution

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Thank you for listening!

Adriano Alessandrini
adriano.alessandrini@unifi.it

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Key measures to be taken in the next 15 years categorized into different aspects of mobility

Mobility aspect	0-5 years	5-10 years	10-15 years
Policy	Liveability needs to remain as the top priority Support testing activities and research incl. legal and regulatory activities	Incorporation of CAVs into city mobility goals Mobility pricing for “SPAM” roaming cars Avoid segregation or prioritisation of CAVs over public transport and active modes	Taxation changes for mobility (Potential) area and vehicle occupancy based road pricing
Infrastructure	Preparation of physical and digital infrastructure Digital infrastructure needs to transition to open access	Reallocation of on-street parking to green and public spaces	Land use changes Modifications to infrastructure and accompanying traffic code (e.g. lane markings, minor changes of infrastructure designs, speed limits, lane width)
Planning	Proactive planning Planning for adaptability and flexibility to technology Stakeholder engagement process to encourage cross-sectoral collaboration and coordination	Update travel demand models and evaluate road capacity needs Assess public transport plans and fleet requirements considering CAV first and last mile solutions Integration of solutions in mobility: electric, intelligent, automated, shared, inclusive	Integration of solutions in mobility: electric, intelligent, automated, shared, inclusive Assessment of required land use changes based on integrated land use and transport modelling tools
Capacity Building for Transport Authorities	Stay educated on mobility technology progress	Reassessment of strategic mobility plans; incorporating new mobility forms	Training for traffic management and public transport operations Restructuring of internal departments (e.g. information technology department, Mobility as a Service (MaaS) department)
Traffic Management	Road authorities need to be more involved in the discussion and	Back office for data exchange in traffic management	Defining data management responsibility with new management schemes New schemes of deploying municipal services, maintenance and logistics traffic at night in the urban area if autonomous functionality is available

Thank you for listening!

Further questions?

Contact

Syrus Gomari
s.gomari@rupprecht-consult.eu

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