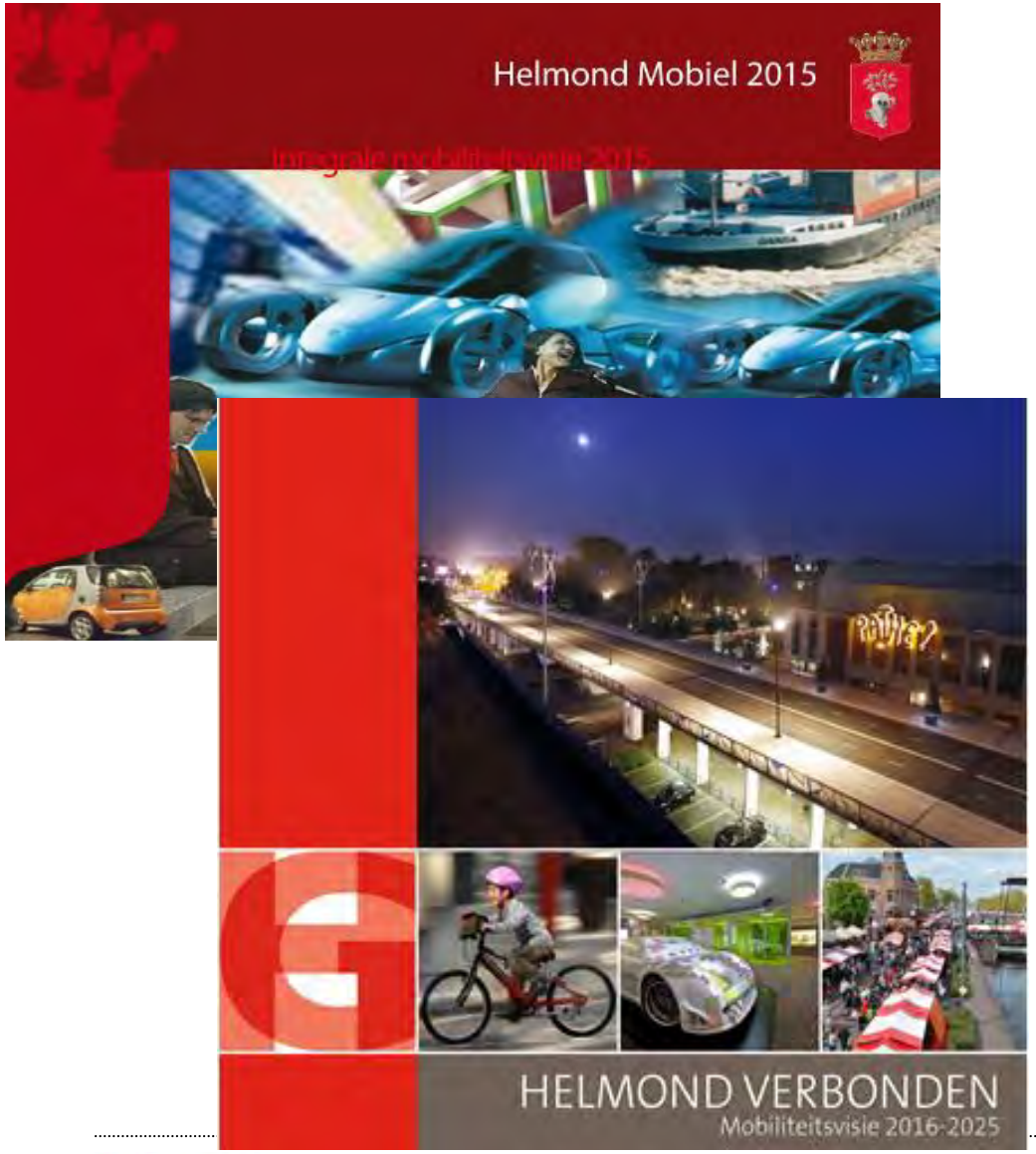
Automated transport, curse or blessing ?
A small cities' view on AV's

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

Driven™
Helmond City of Smart Mobility

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)

Source: FREILOT project

14 equipped intersections in urban zone

Period	Number of crossings	Number of stops	% of stops
Baseline	408	52	13%
Pilot	343	20	6%

Number of crossings and stops in both periods

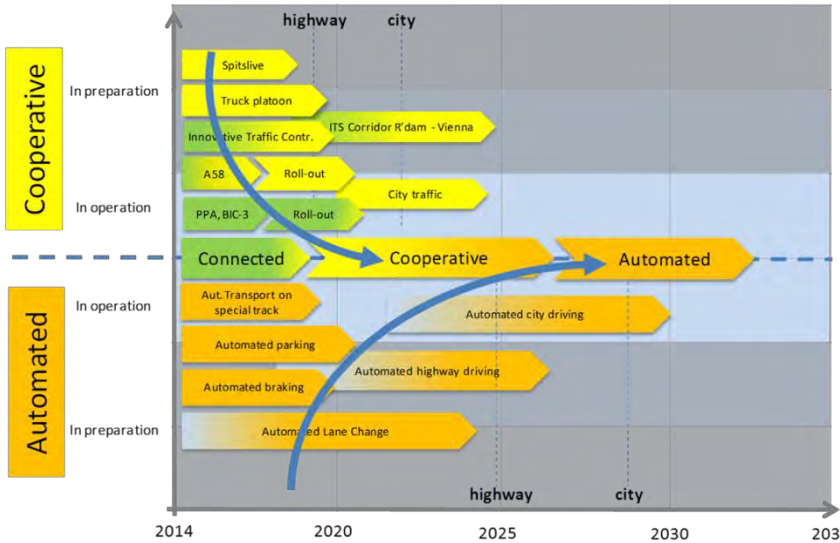
	Baseline	Pilot	Rate of change
CO_2 emissions (g/km)	644	562	-13%
NO_x emissions (g/km)	3.87	3.33	-14%
Fuel consumption (l/100km)	24	21	-13%
Speed (km/h)	35	36	+2.6%

Emissions, consumption and speed variations

Driven™
Helmond City of Smart Mobility

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

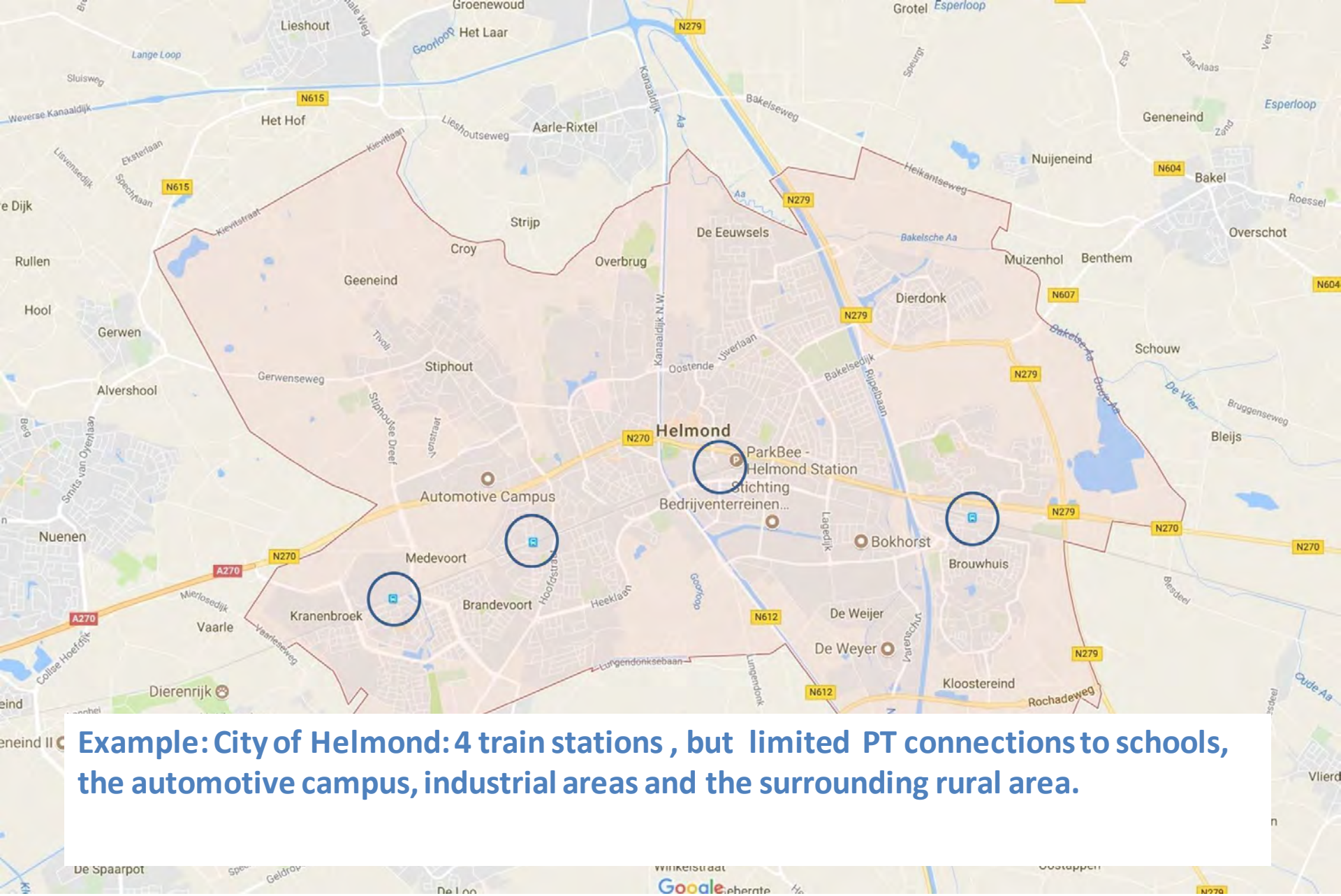
Public Transport in small and medium sized cities

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

Result:

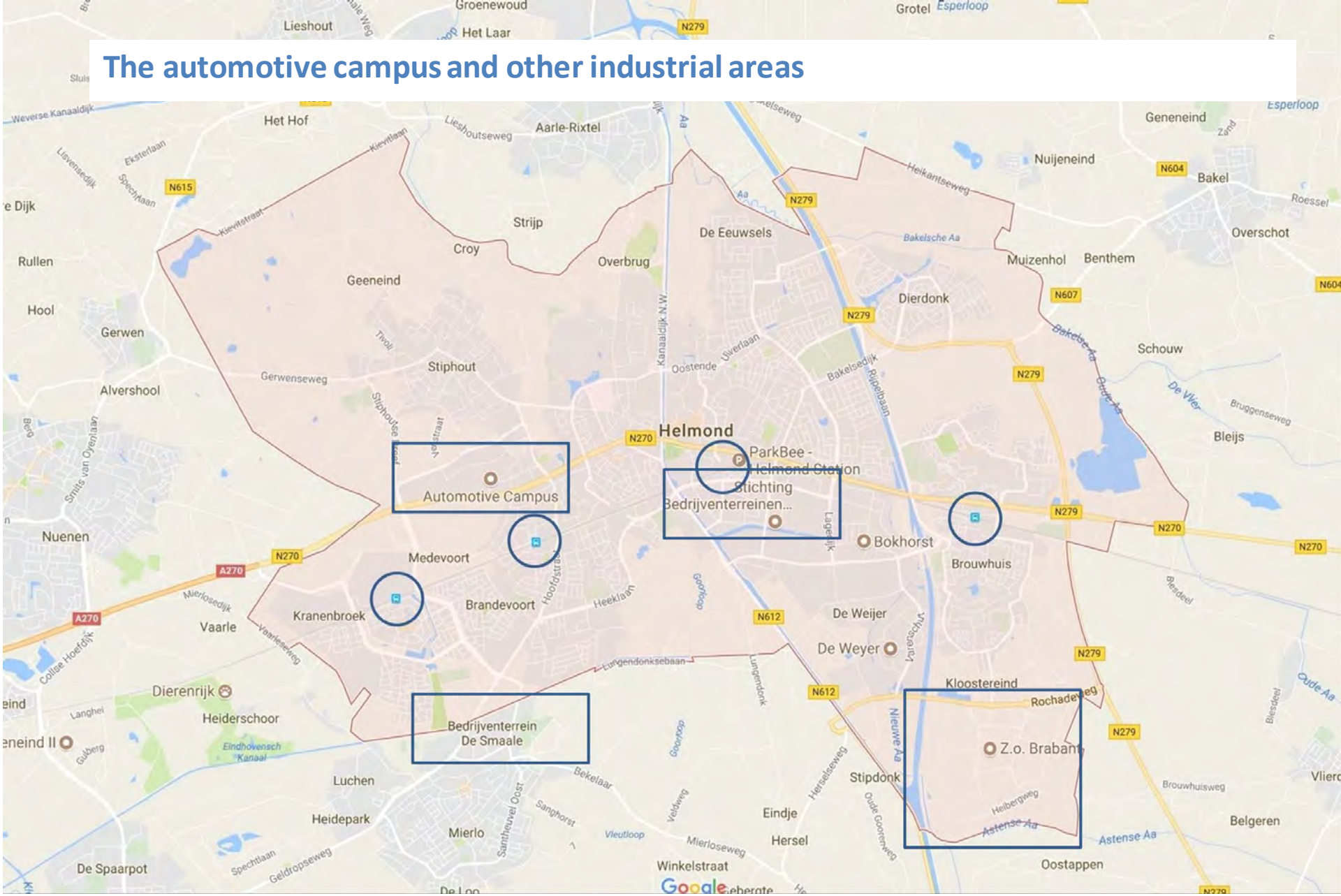
- Sometimes ridiculous C/B ratio for PT (drivers salaries – empty busses)
- Strongly limited PT available outside peak hours.
- Hardly any PT to outlying rural areas.

Therefore strong focus on private cars as the main means of transport.

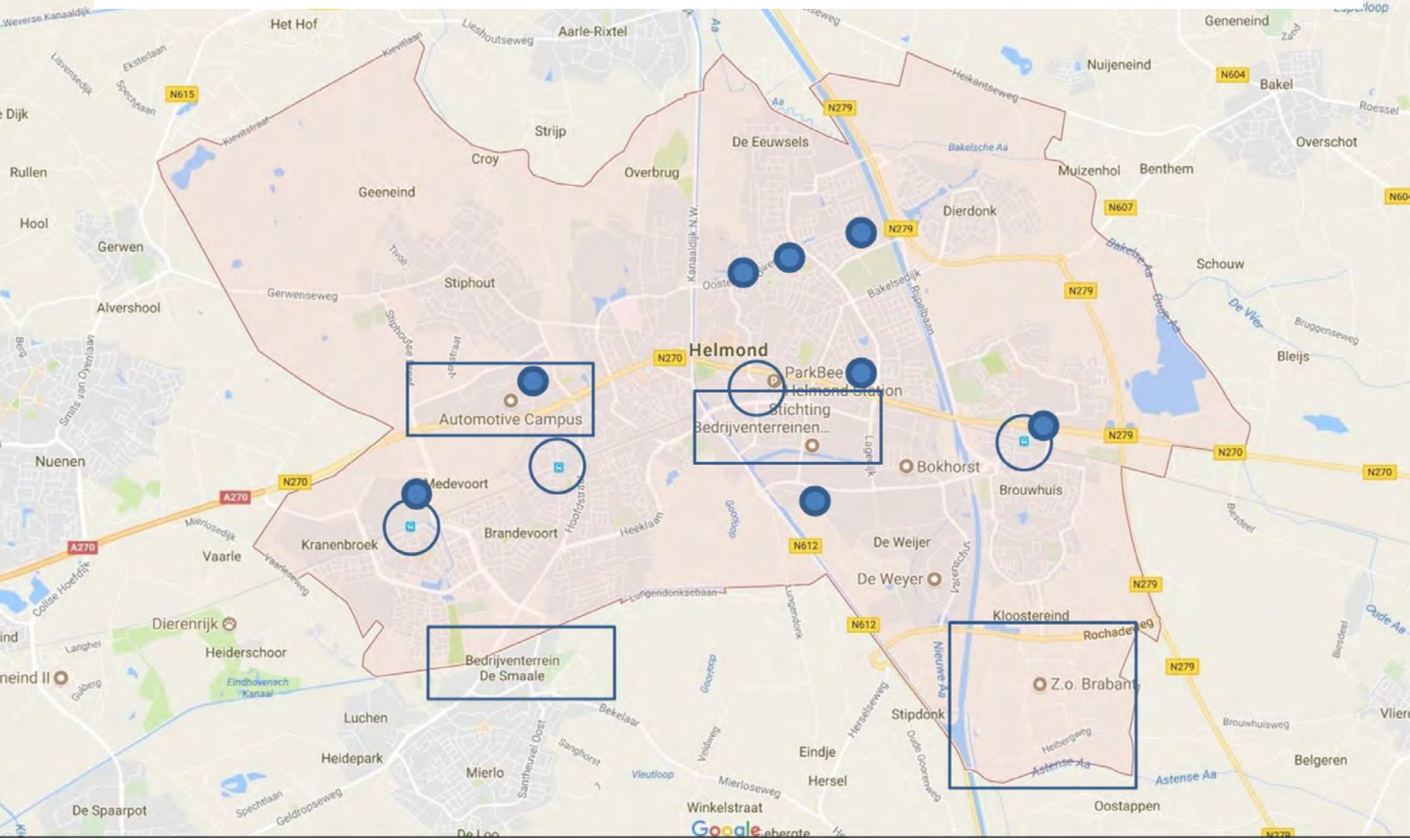


Example: City of Helmond: 4 train stations , but limited PT connections to schools, the automotive campus, industrial areas and the surrounding rural area.

The automotive campus and other industrial areas



Major secundary 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).

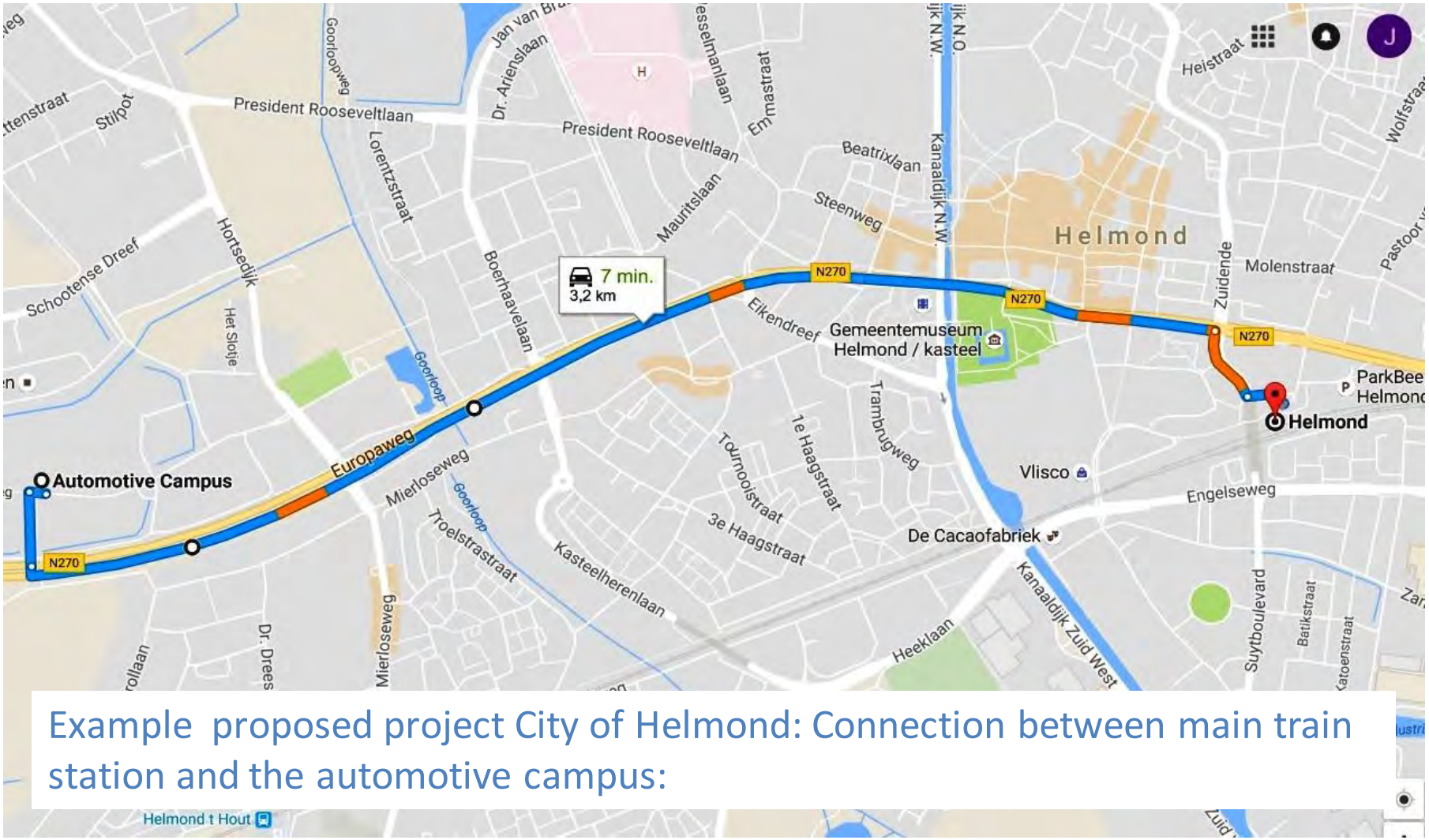
MAKING AUTOMATION WORK FOR (small) CITIES

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.

MAKING AUTOMATION WORK FOR (small) CITIES



Example proposed project City of Helmond: Connection between main train station and the automotive campus:

Driven™
Helmond City of Smart Mobility

MAKING AUTOMATION WORK FOR (small) CITIES

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

MAKING AUTOMATION WORK FOR (small) CITIES

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

www.drivenbyhelmond.nl

g.blom@helmond.nl

Mobile: + 31 6 53 21 48 51

EUROPEAN CITIES AND REGIONS NETWORKING
FOR INNOVATIVE TRANSPORT SOLUTIONS

Some preliminary views from European cities and regions on AVs

Gert Blom, city of Helmond/Polis

What is Polis ?

Network

Exchange of experiences

70 European cities & regions

European research

Innovation

European Institutions

Sustainable urban mobility

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

POLIS GLOBAL PLATFORM

TRANSVERSAL TOPICS

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 ?

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

Autopilot | Self Driving

www.volvocars.com/au/about/innovations/intellisafe/autopilot

IntelliSafe

Sit back

How will you use the extra time you'll
Relax with a newspaper? Meet those
the kids? What's more, you won't ever

A study into driverless cars has ca
for a driver to switch from automa
control in order to ensure maximu

A team from the University of Southampton
'control transition times' for participants to

The researchers believe their findings will
the lead time needed to take control of a ve
average time needed for a person to succe
times..

Engineers Professor Neville Stanton and A
conditions, drivers needed between 1.9 an
Such a large range reflects a variety of driv

The authors observed 26 men and women
simulated driving at 70mph, with and witho
task.

They recorded response times as the drive
system.

Uber self-driving car drives through red light in San Francisco - video

and this com
carries on d

0:13 / 0:31

One of Uber's computer-
Francisco as a pedestrian
Wednesday by Charles R
has blamed the traffic vid

Uber blames humans f

News Policy Opinion Video Events Extra Jobs

© Getty

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 rosy 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

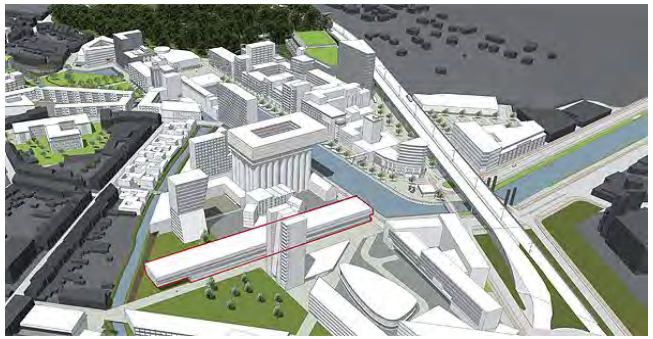
- **Spatial**
  - Some off and on-street parking could become redundant - but newly created road space must be put to other functional uses to prevent it being taken up by traffic or remaining vehicles
  - Urban sprawl and longer commuting trips
- **Social**
  - Enhance accessibility to persons with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

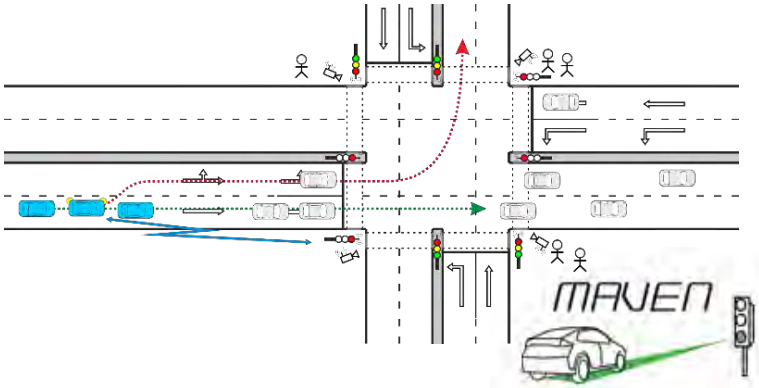


AV services

VRU safety

Travel behaviour

Traffic management implications



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

Suzanne Hoadley
shoadley@polisnetwork.eu
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

Background and Understanding I

- 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 evolutional 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

leidos

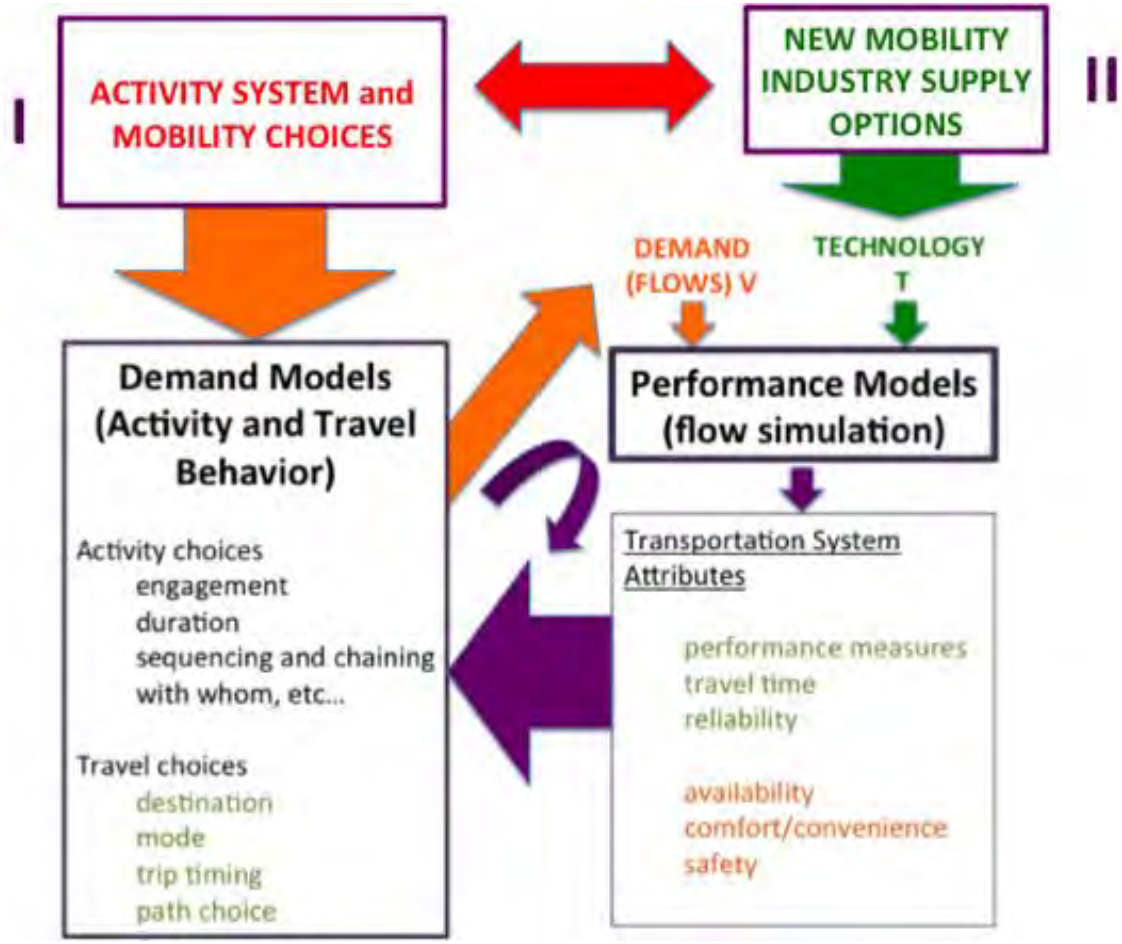
Northwestern University

CALIFORNIA PATH

CAV AMS Framework

Potentially major changes in

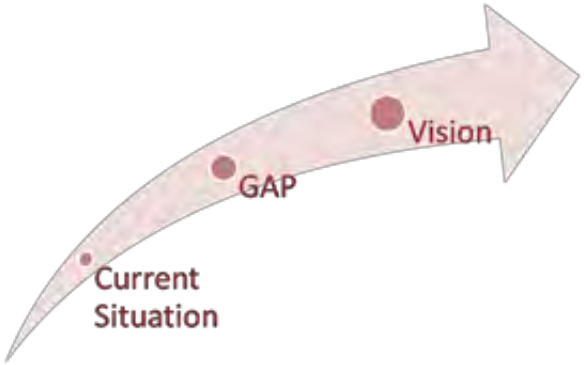
- Travel and activity behaviors
- Supply side, e.g. new mobility options



Strategic Level Planning Framework with CAV

Source: Mahmassani, et al, 2017

Gap Analysis



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

Gap Analysis II

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

Contact

- 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

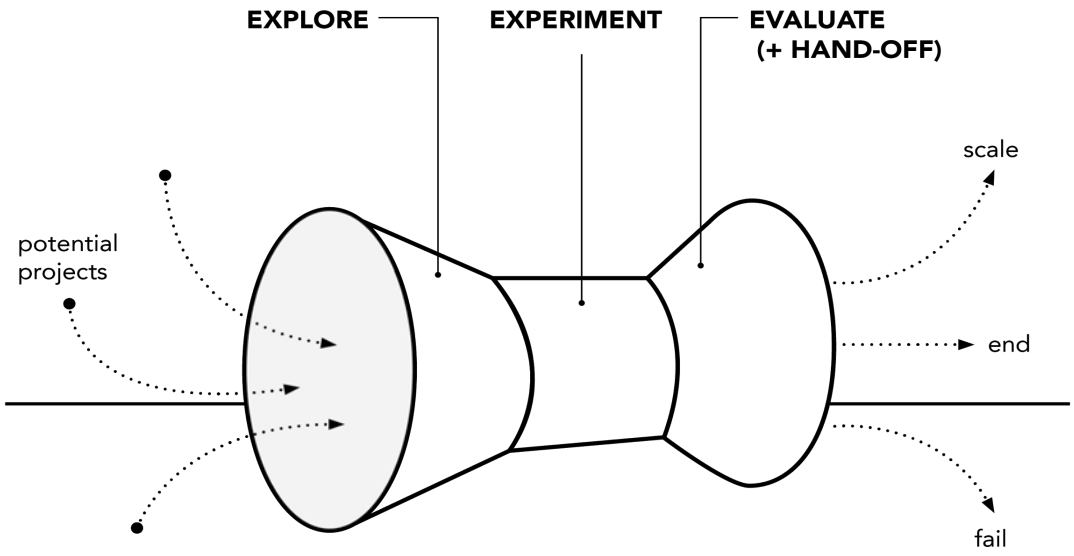
Making Automation Work in Boston

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



"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

Access	Make Boston's neighborhoods interconnected for all modes
Safety	Substantially reduce crashes through design and education
Reliability	Make travel predictable on transit and roadway networks

Citizen-informed vision

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

Access	better connections to major transit lines.
Safety	a reduction in human-error caused crashes by 90%*
Reliability	connected vehicles could mean better efficiency and more predictable transportation

**personally skeptic of this number*

Motivation: Safety

Boston

22 | **4,548**

Source: 2016 Boston Vision Zero

Motivation: Safety

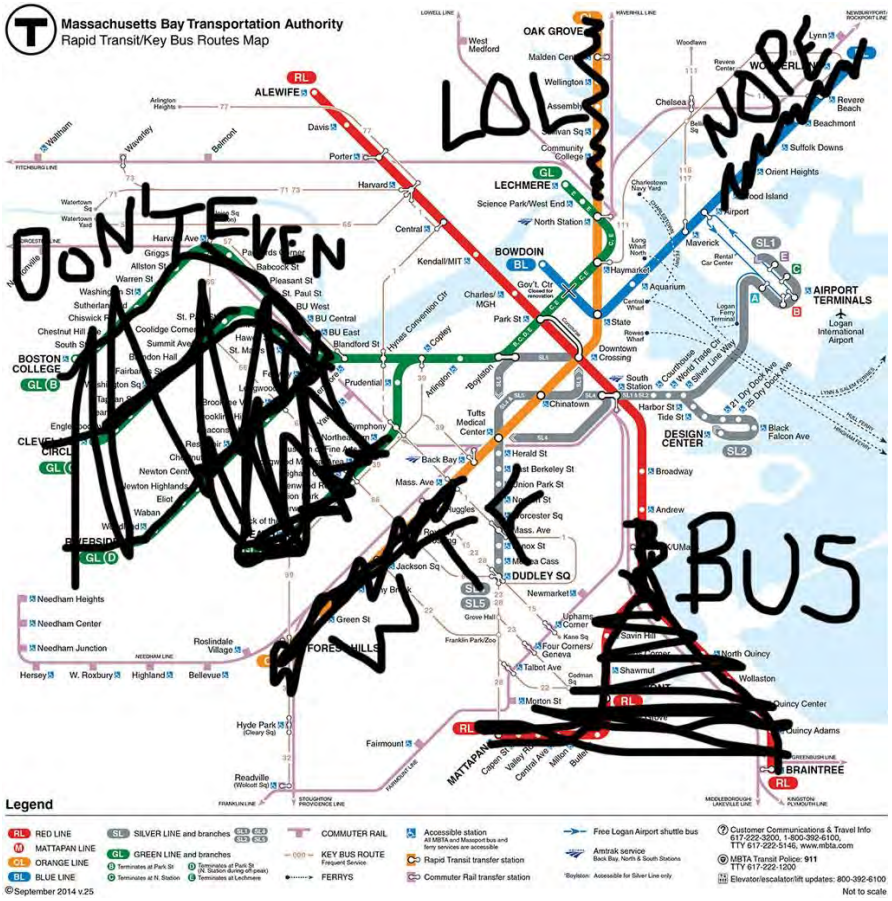
90% reduction

2	455

Source: 2016 Boston Vision Zero

Motivation: Reliability & Resilience

(un)Official MBTA Snow Map February 2015

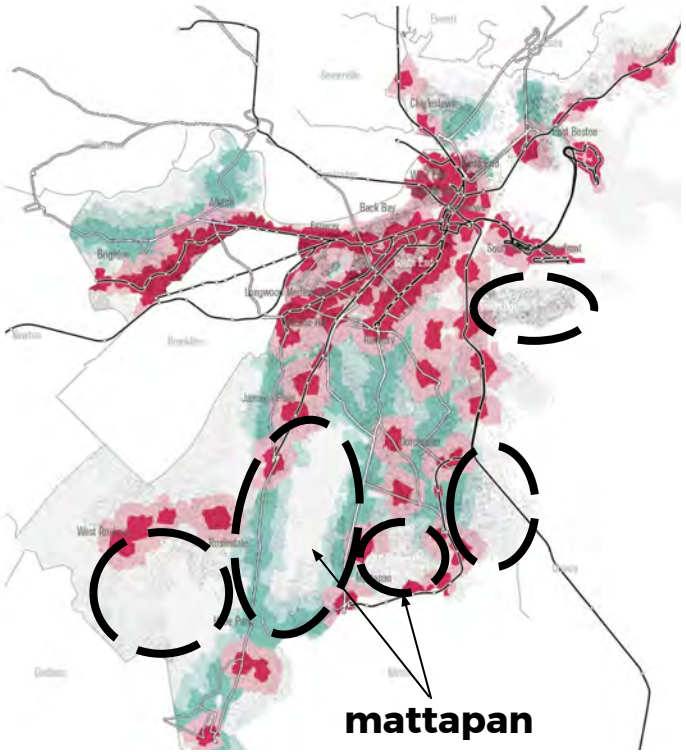


Source: Sara Morrison

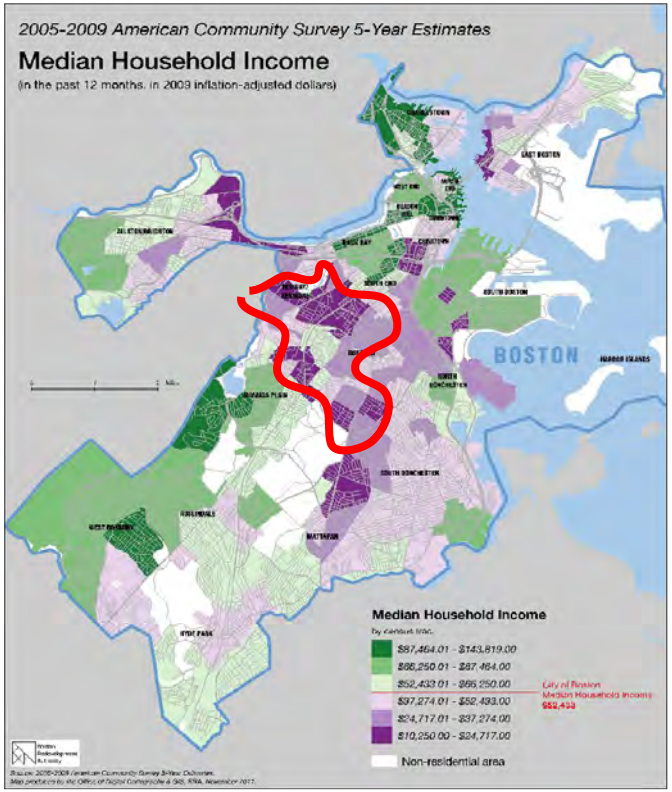
Motivation: Better Access

Average commute in Boston is **29 minutes**

24% of Mattapan residents have a commute **over 60 minutes**



Motivation: Ensuring Equitable Access



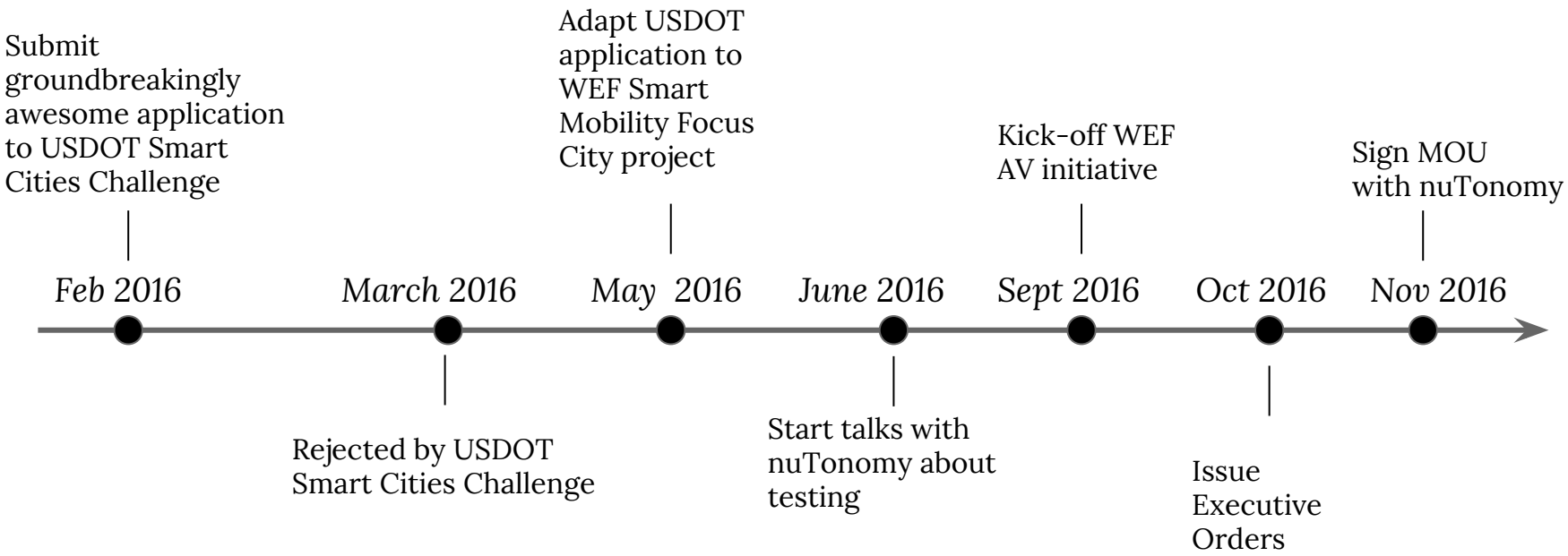
Source: Boston Globe

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



Governance: Boston's Approach

By His Excellency

CHARLES D. BAKER
GOVERNOR

EXECUTIVE ORDER NO. 572

To Promote the Testing and Deployment of Highly Automated Driving Technologies

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

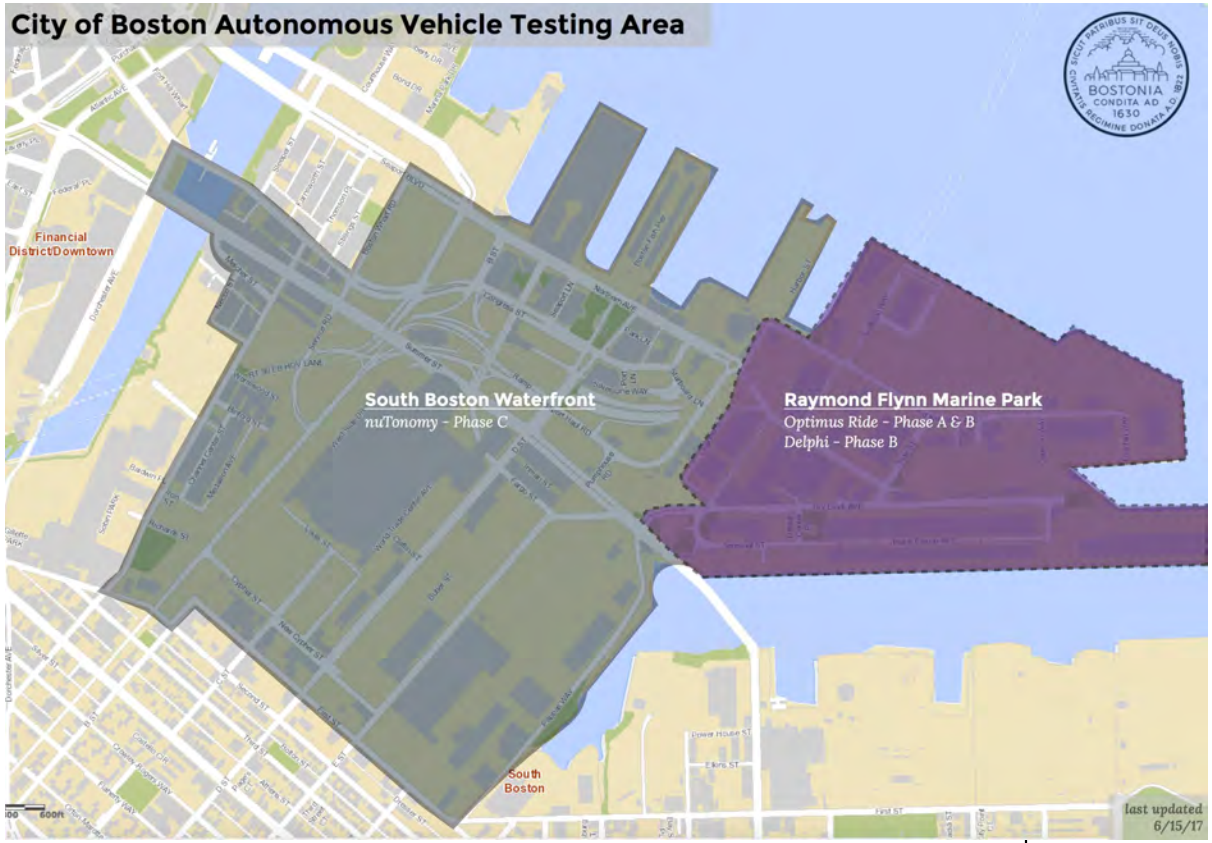
Vehicle Testing

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



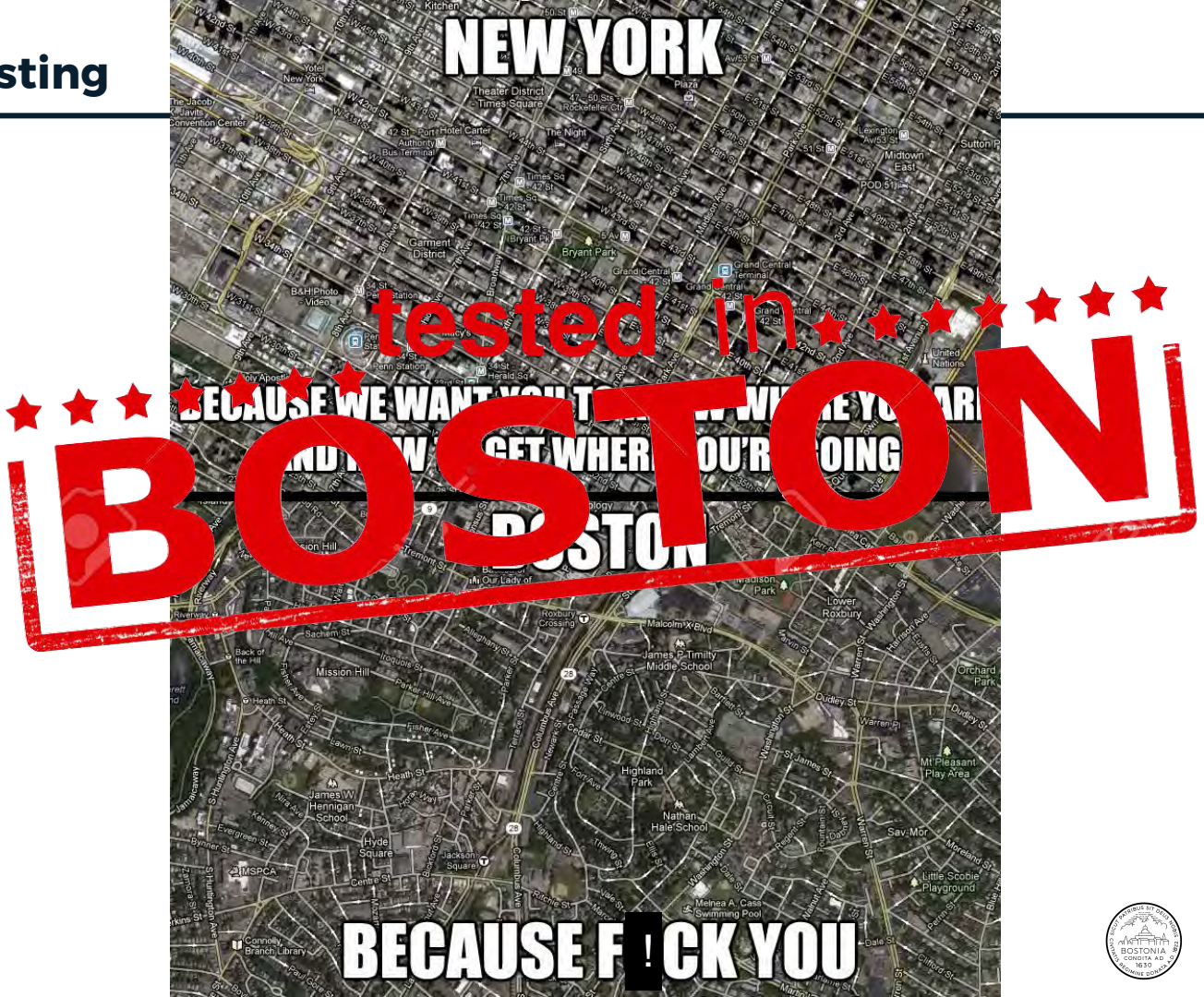
Vehicle Testing: Uniqueness

Fahckin' Seagulls Menace Boston's Self-Driving Cars

Ryan Felton
2/07/17 4:16pm • Filed to: CAR TECHNOLOGY

8.1K 56 4

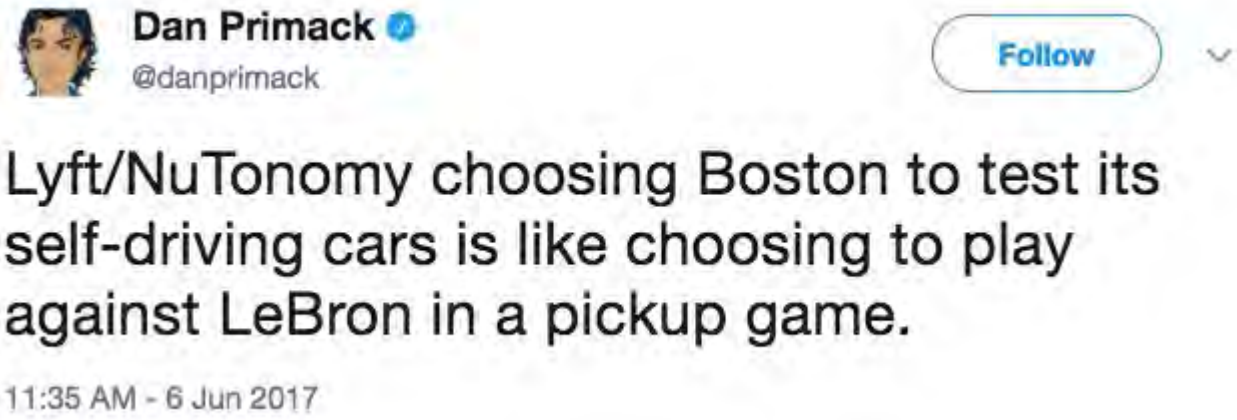
Vehicle Testing



THE MAYOR'S OFFICE OF
NEW URBAN MECHANICS

City of Boston
Mayor Martin J. Walsh

Vehicle Testing: up next



Infrastructure: How do we fund roads in the future?

City of Boston Roadway Projects (FY16):

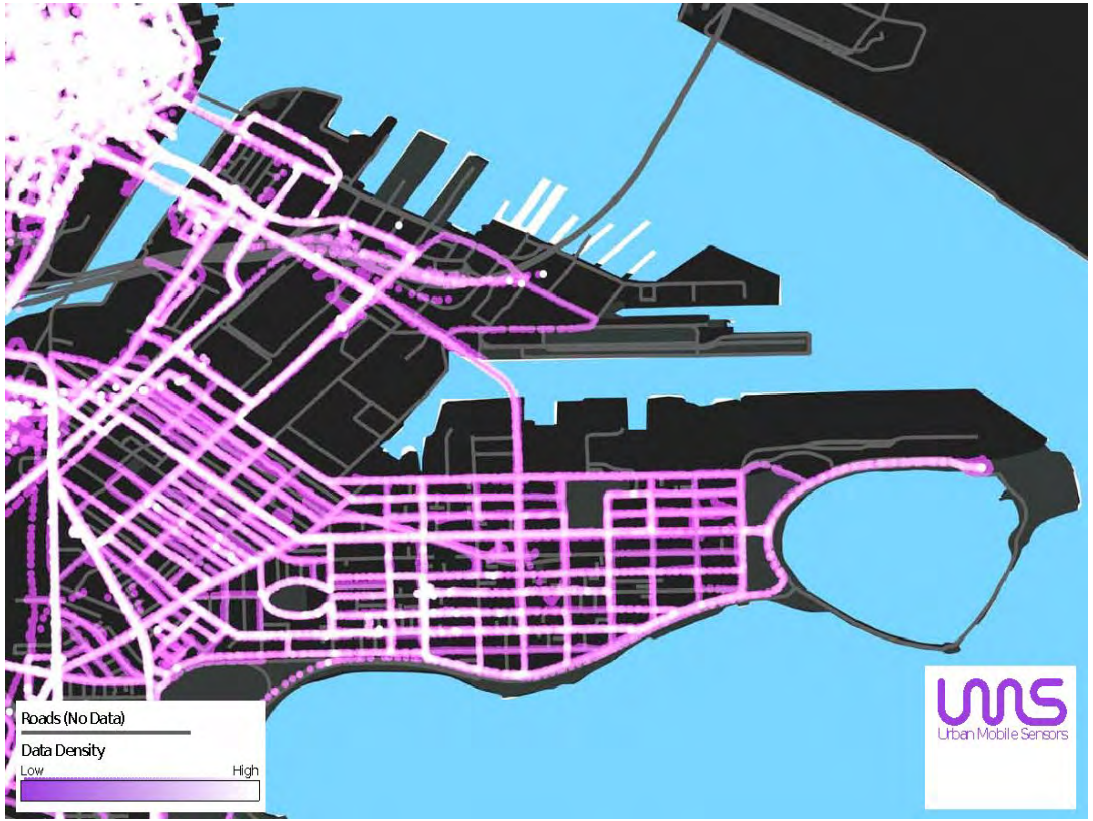
$45M road reconstruction & bridge maintenance
$9M Resurfacing roadways

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)

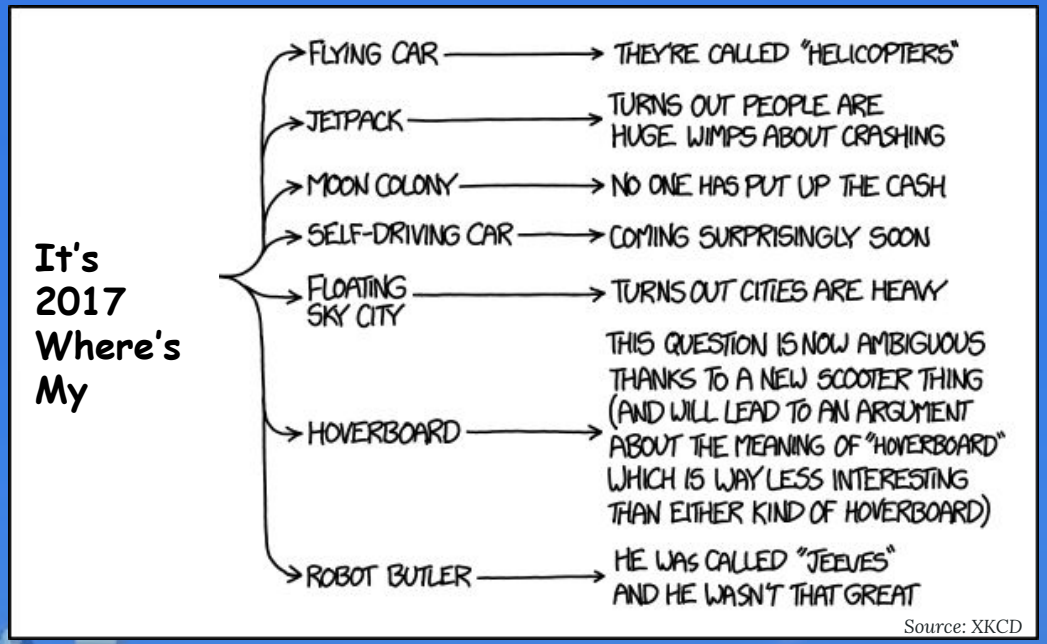
- Digital record of the curb
- Operations tool
- Building towards an API

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*



Source: XKCD

Thank you

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

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?).
3. Get going. Follow a **light-weight, incremental approach**. Systematically build critical mass.
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 **READYNESS?**

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)

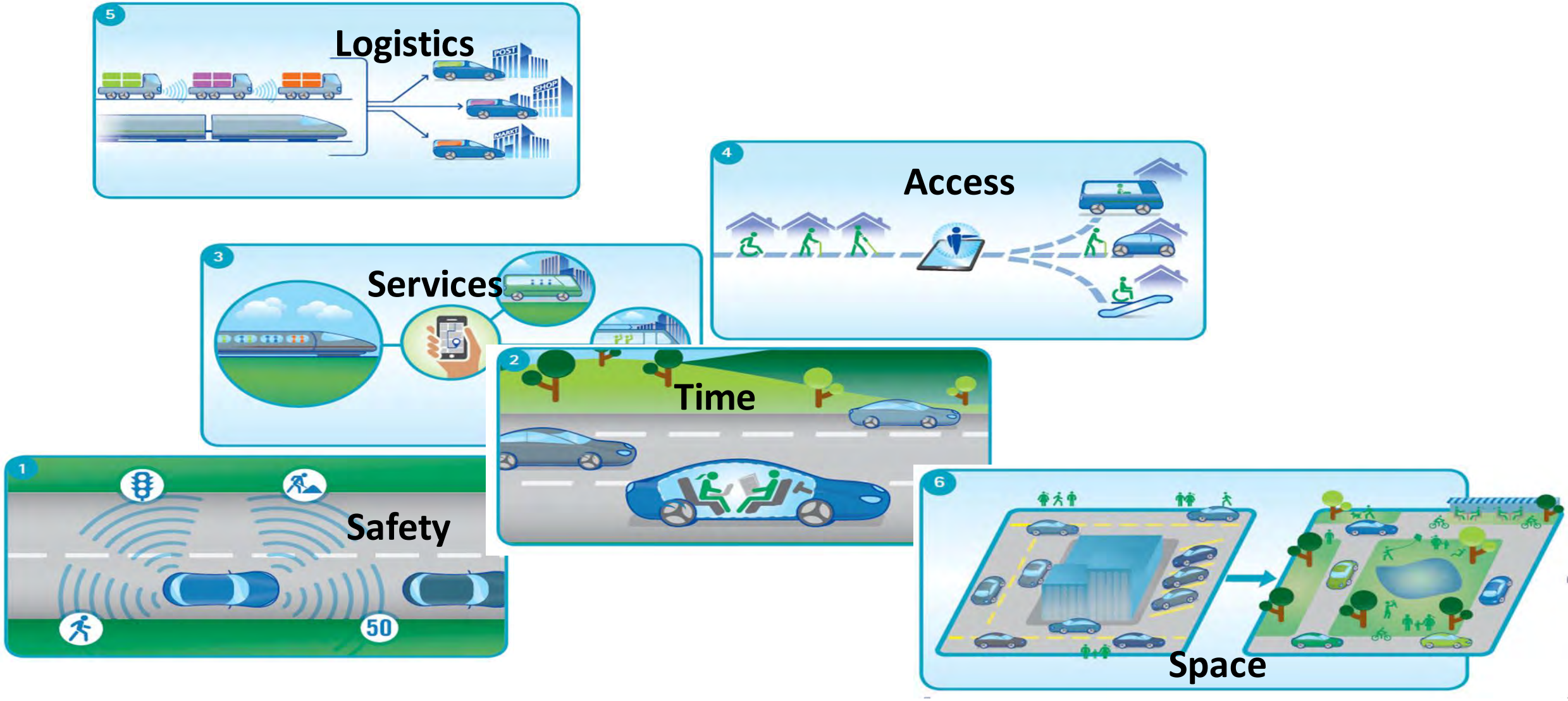
+ Impact assessment & evidence

Transport system & Policy transition

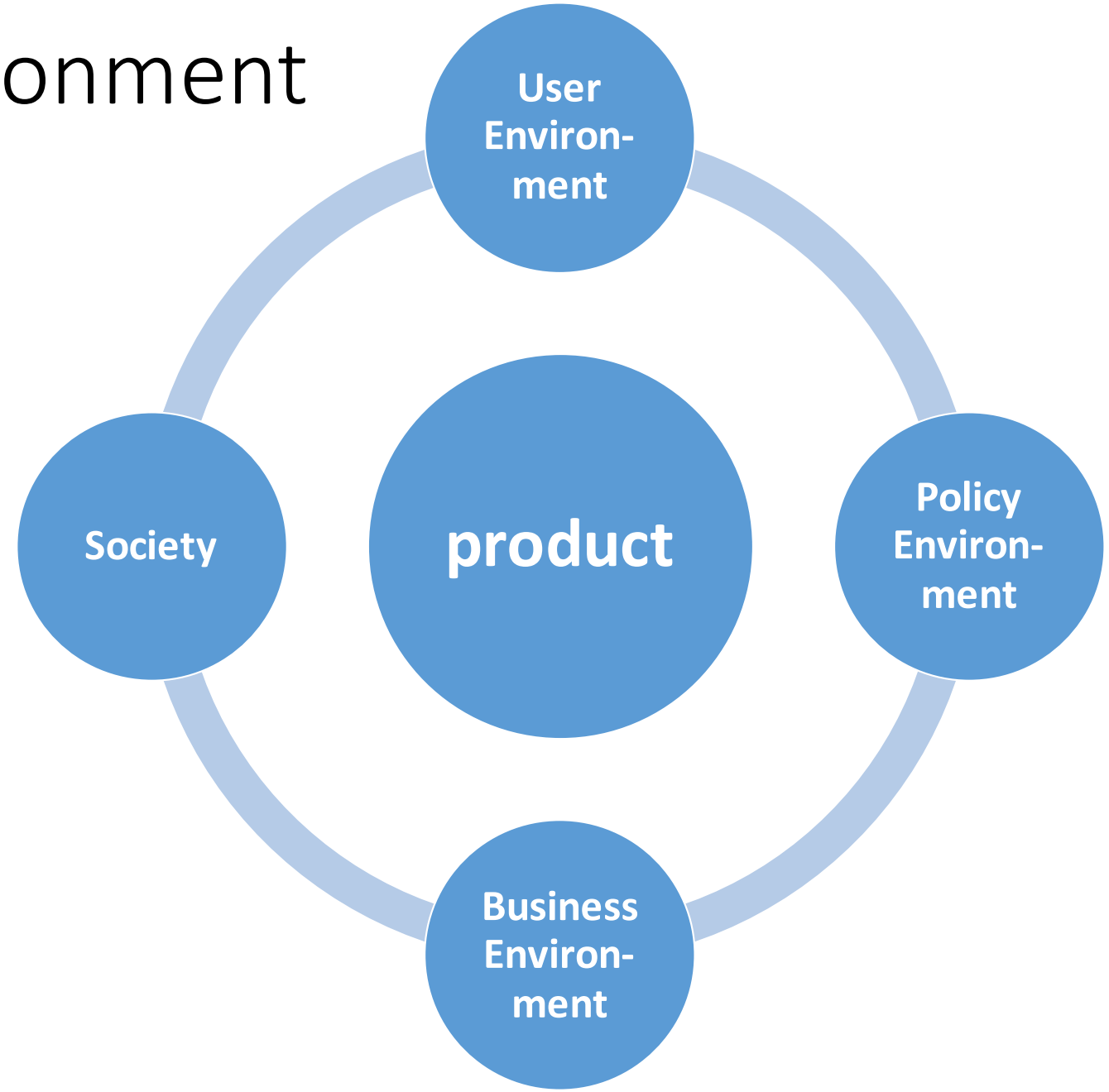
Safeguard „+“ impact

Generate added value

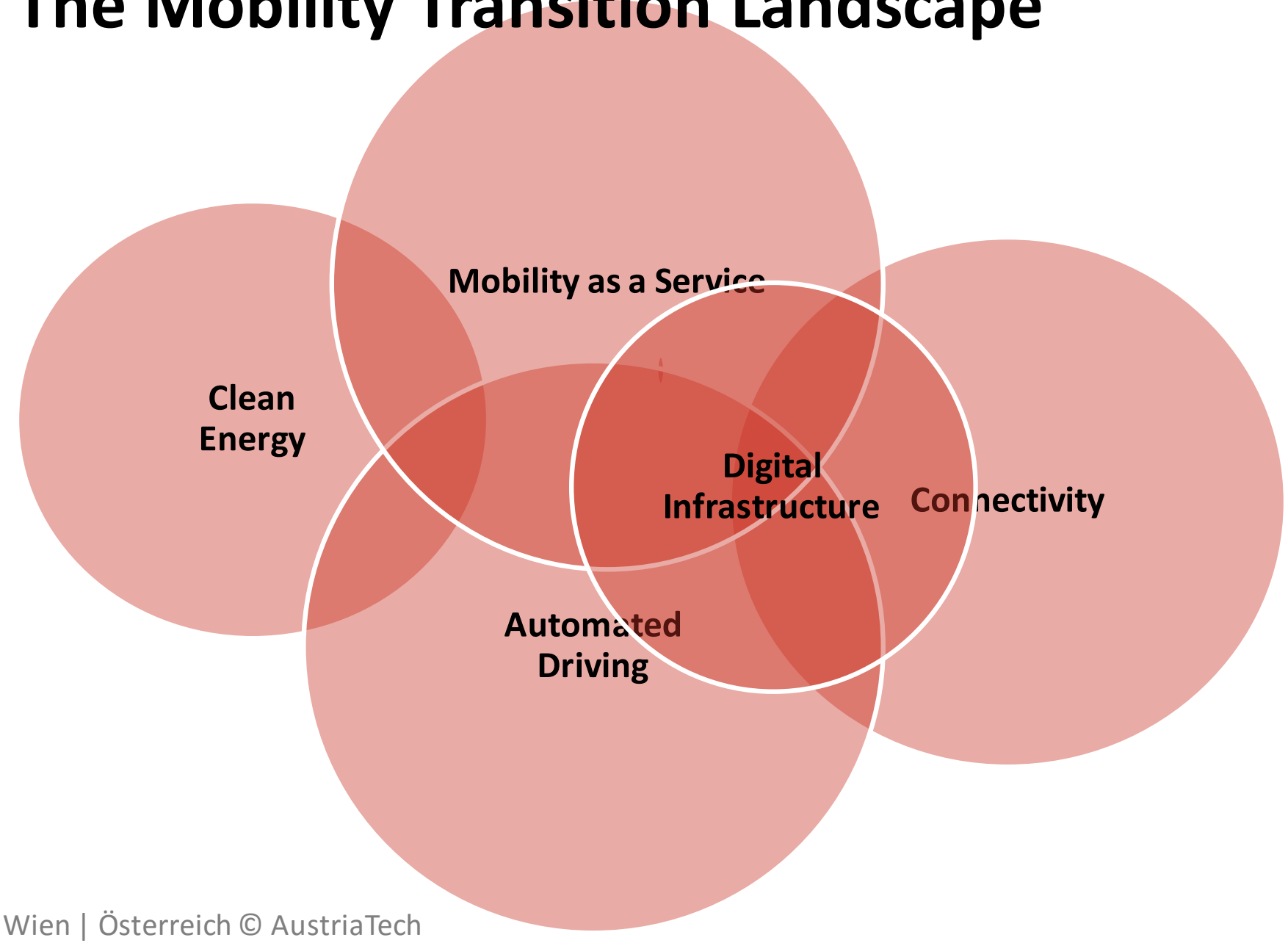
City Use Cases - Timeline



CCAD Environment



… The Mobility Transition Landscape



Foresight & Planning

↓

Evaluation & Monitoring

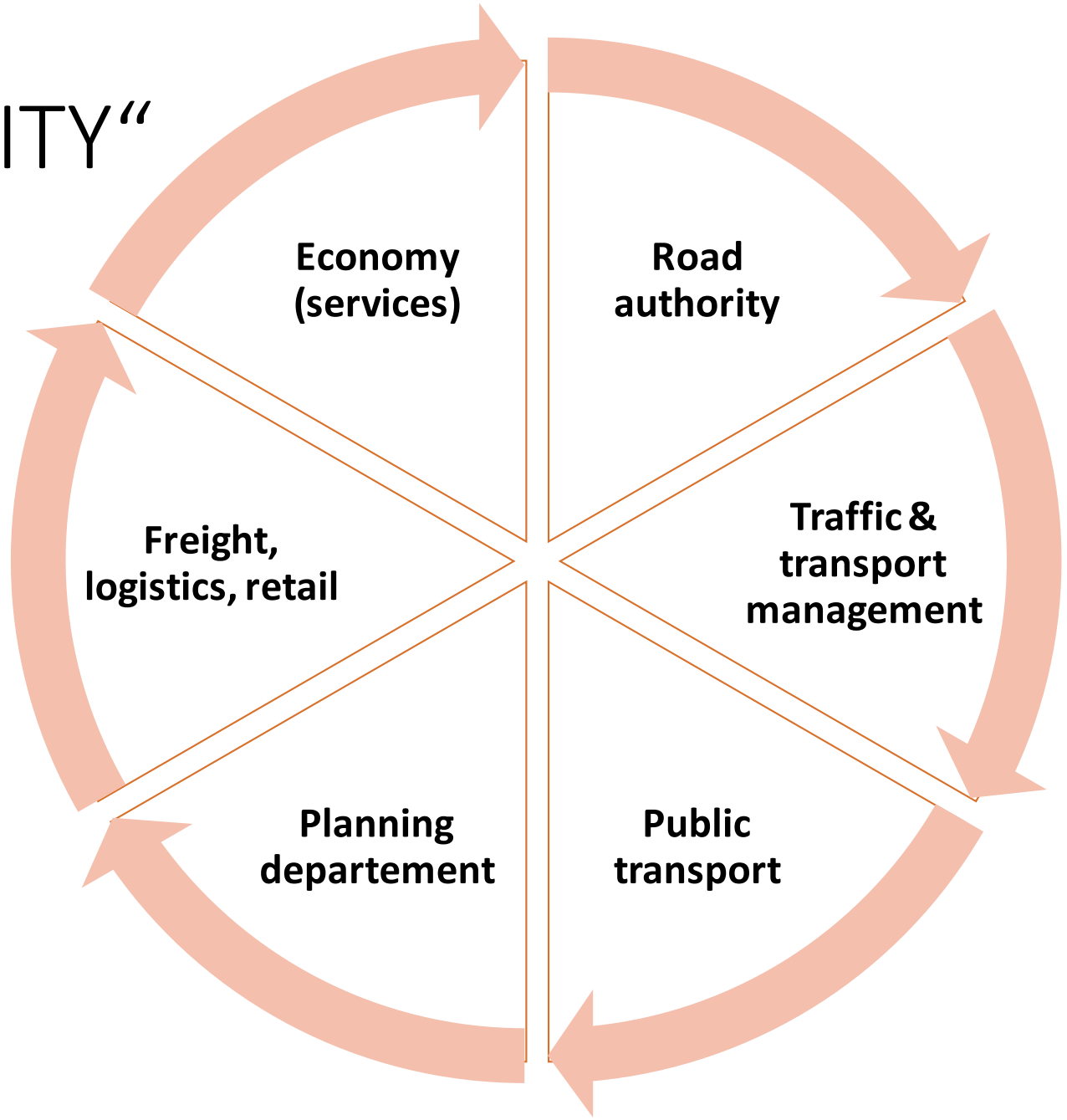
↓

Value Creation & Labour Market

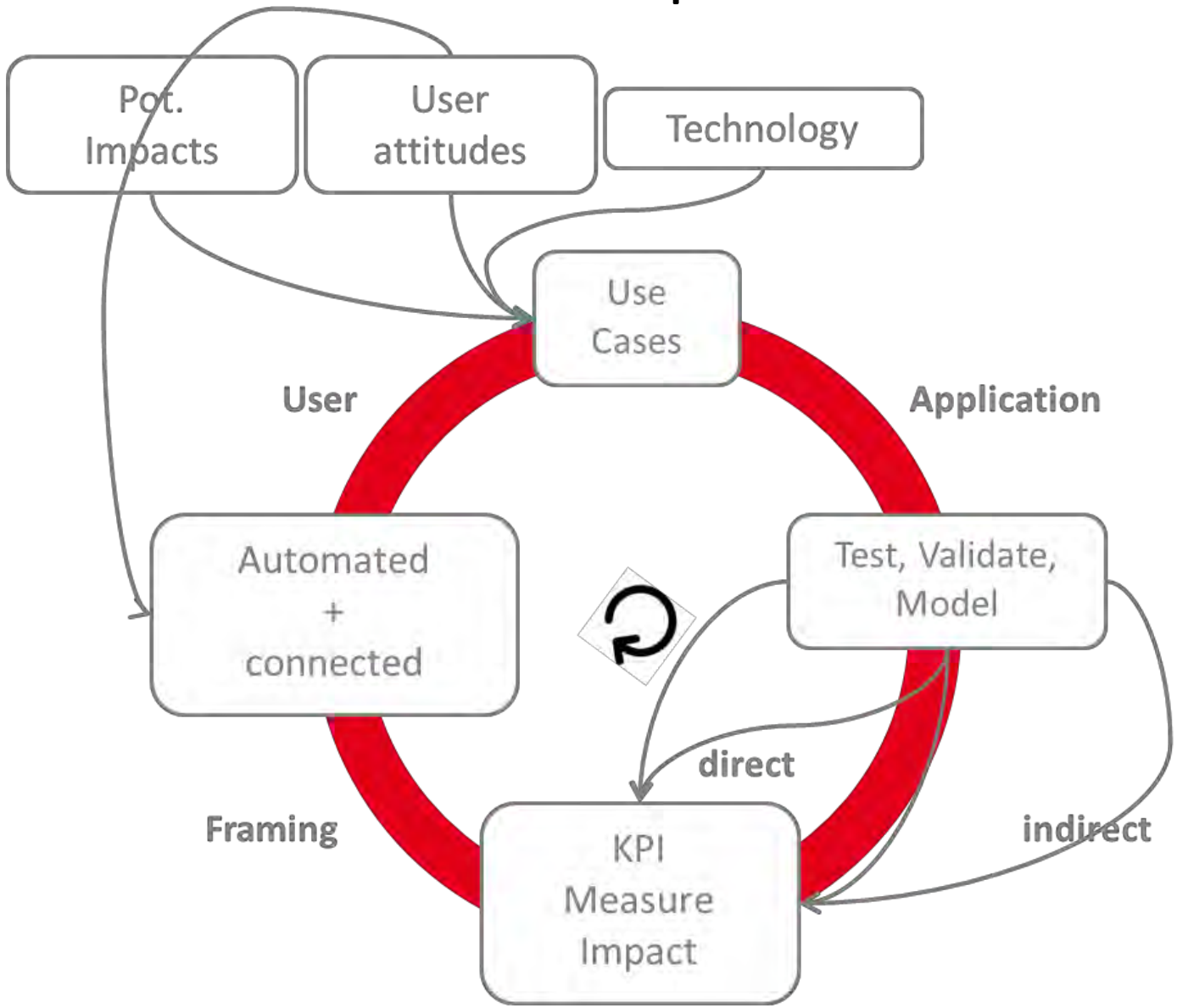
↓

Innovation & Procurement EcoSystem

Work with „THE CITY“



From expectations towards experiences!



HOW WILL CITIES USE AUTOMATED VEHICLES?

AVENUE21

future.lab

TU WIEN TECHNISCHE UNIVERSITÄT WIEN Vienna | Austria

Daimler und Benz Stiftung

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**

austriatech

1st things 1st

Economic Impact (CCAD and new services as growth factor)

Societal impact & dialogue;

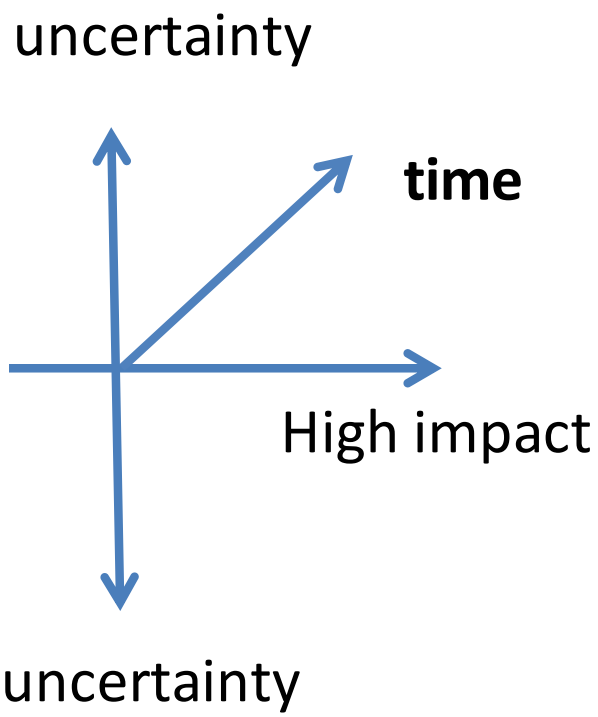
Policy, Trust, Ethics and Legal frame

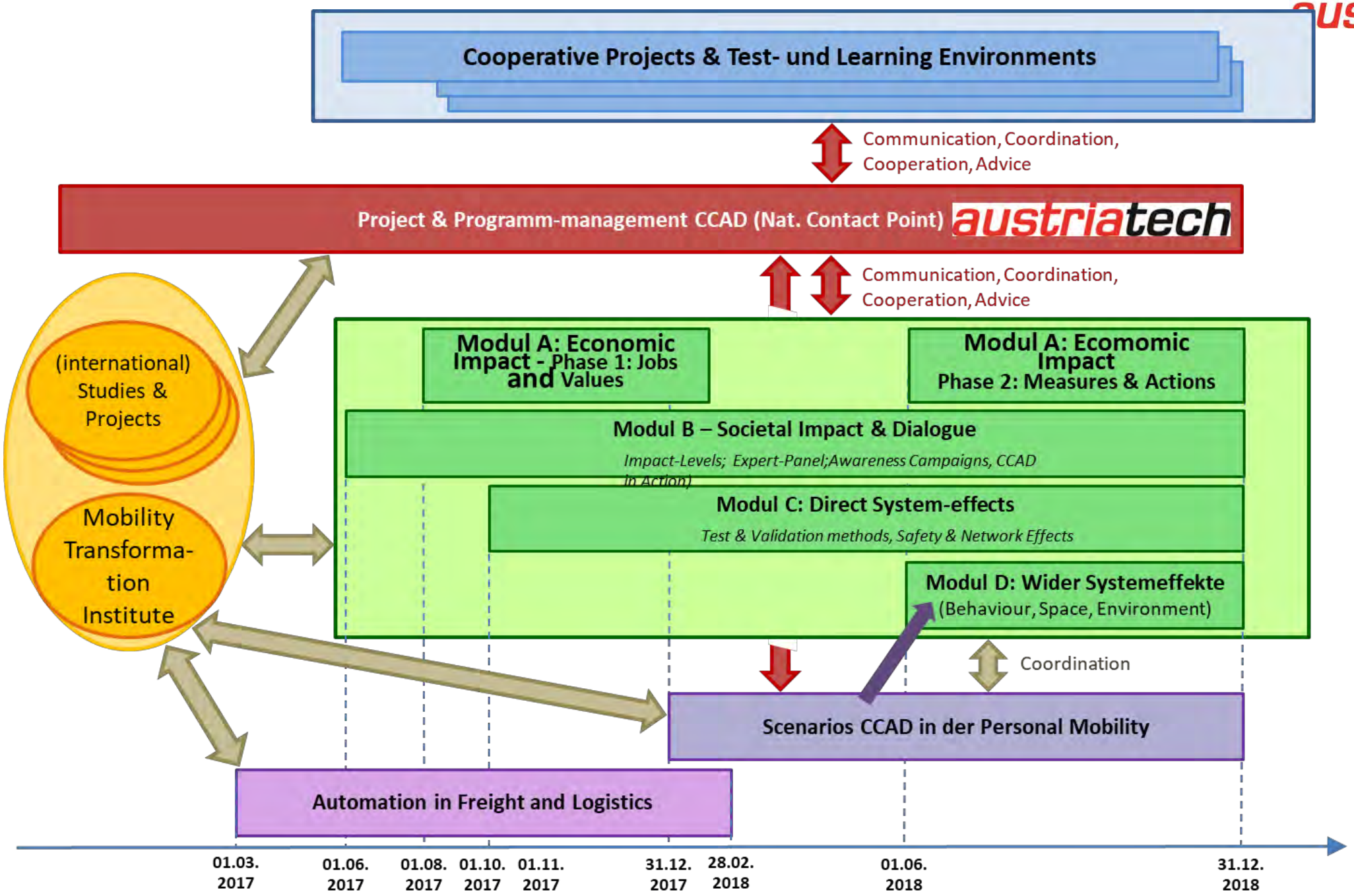
Direct system effects:

Safety & network

Indirect effects:

Behaviour, land-use, environment




austriatech
Cooperative Projects & Test- und Learning Environments
Communication, Coordination, Cooperation, Advice
Project & Programm-management CCAD (Nat. Contact Point)
austriatech
Communication, Coordination, Cooperation, Advice
(international) Studies & Projects
Mobility Transforma-tion Institute
Modul A: Economic Impact - Phase 1: Jobs and Values
Modul A: Ecomomic Impact Phase 2: Measures & Actions
Modul B – Societal Impact & Dialogue
Impact-Levels; Expert-Panel;Awareness Campaigns, CCAD in Action)
Modul C: Direct System-effects
Test & Validation methods, Safety & Network Effects
Modul D: Wider Systemeffekte
(Behaviour, Space, Environment)
Coordination
Scenarios CCAD in der Personal Mobility
Automation in Freight and Logistics
01.03. 2017
01.06. 2017
01.08. 2017
01.10. 2017
01.11. 2017
31.12. 2017
28.02. 2018
01.06. 2018
31.12. 2018

…and next – the readyness 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?).
3. Get going. Follow a **light-weight, incremental approach**. Systematically build critical mass.
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

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

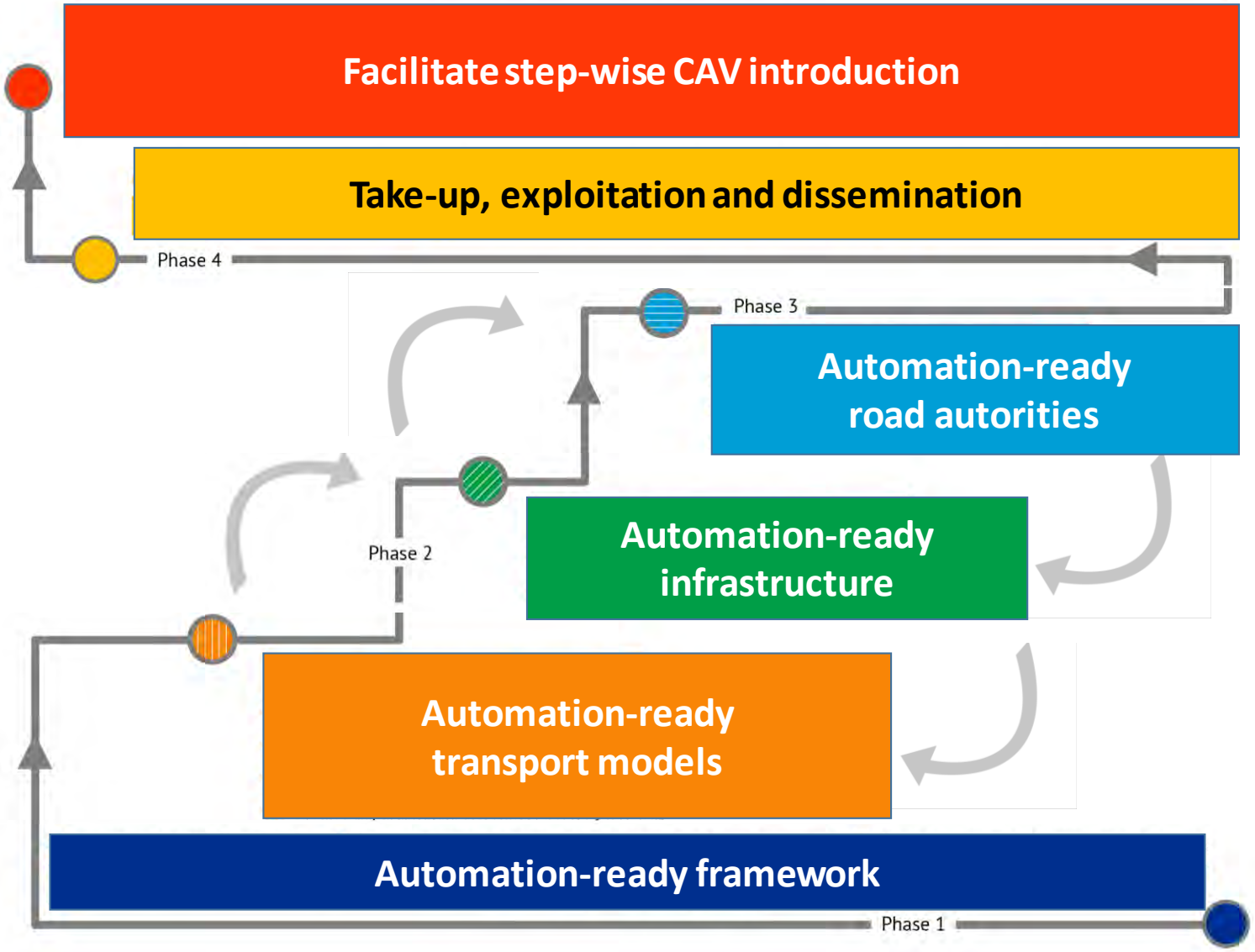
CoEXist

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

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

RUPPRECHT CONSULT
Forschung & Beratung GmbH

CoEXist Concept

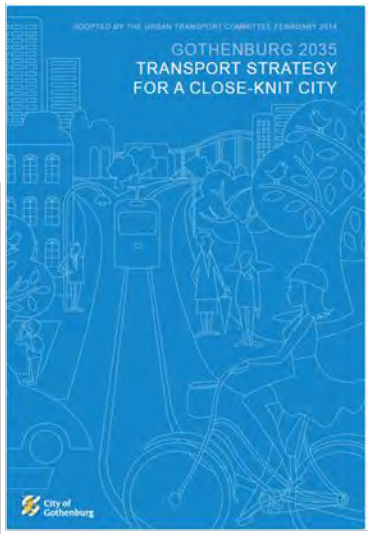


CoEXist Analysis – Modelling - Simulation (AMS) Framework

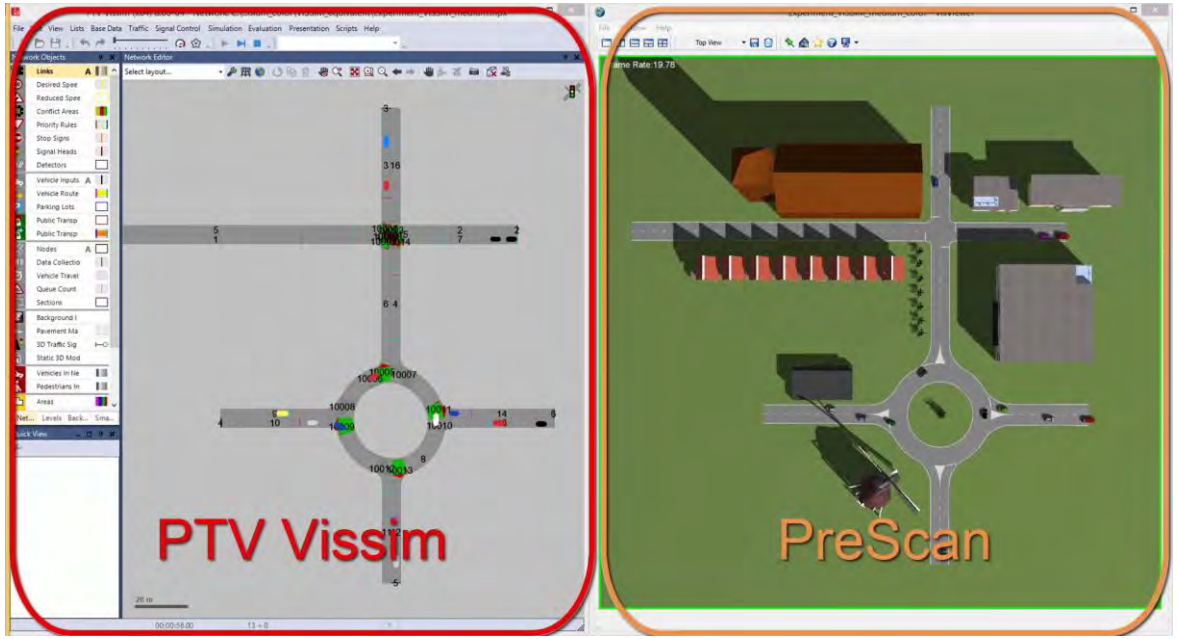
- **Simulation** (Renault, Vedecom, TASS International, PTV)
  - Create closed-loop connection between Renault & Vedecom CAV control logic with PreScan AV simulator and Vissim traffic flow simulator to extract **behavioural parameters of CAV applications**.
- **Modelling** (PTV and University of Stuttgart)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

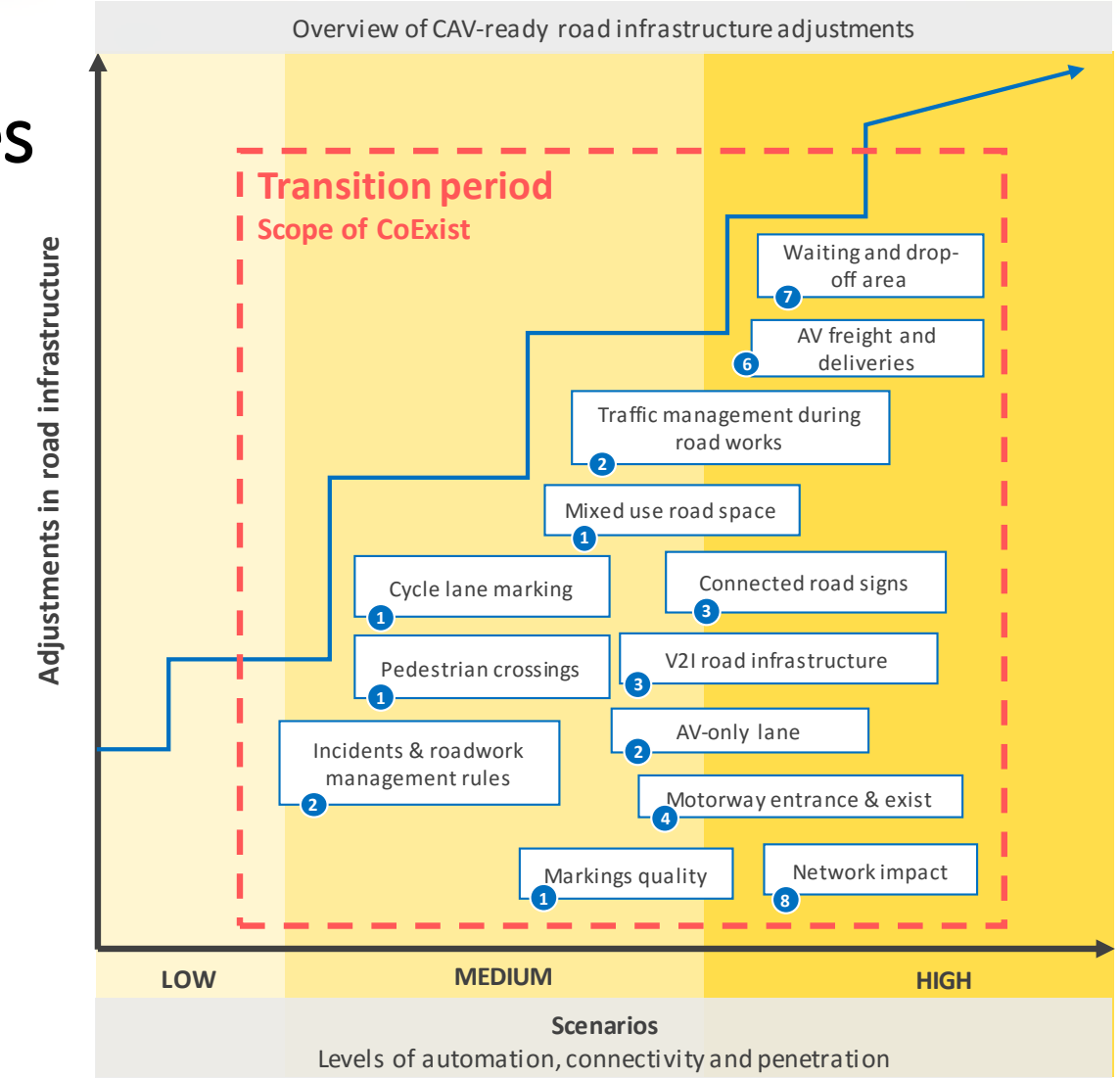


WP2 CoEXist – AMS tools – Vissim and PreScan



AV Control Logic

WP4 Use Cases



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.

Siegfried Rupprecht

Rupprecht Consult – Forschung & Beratung GmbH
Clever Str. 13 – 15, 50668 Köln (Cologne), Germany
Tel +49 221 60 60 55 - 11
s.rupprecht@rupprecht-consult.eu

www.rupprecht-consult.eu
www.mobility-academy.eu

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)

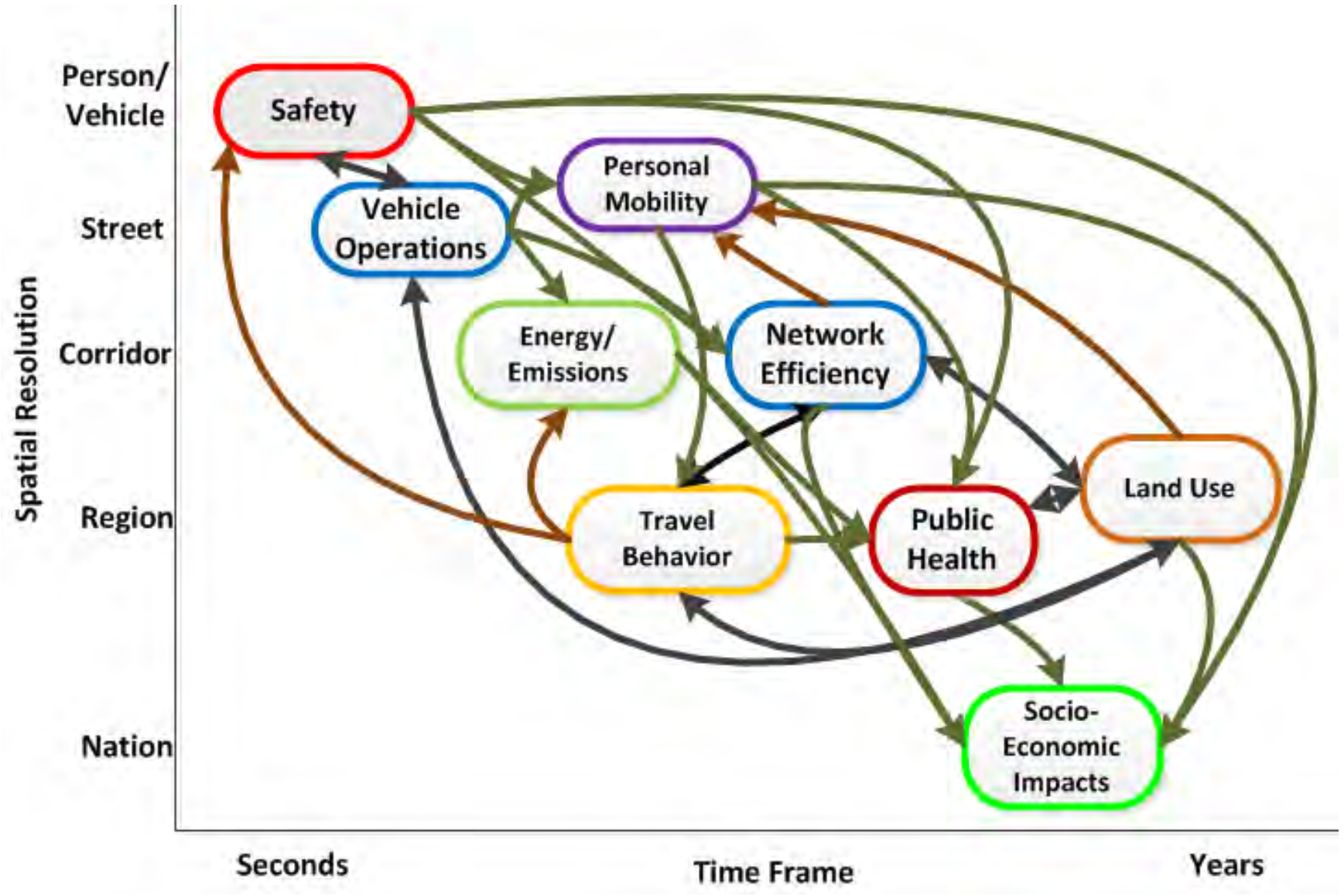
Vehicle type
- Lightweight vehicle (e.g., golf cart)
- Automobile / pod
- Bus
- Truck

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


Person/
Vehicle
Street
Corridor
Region
Nation
Spatial Resolution
Safety
Vehicle
Operations
Personal
Mobility
Energy/
Emissions
Network
Efficiency
Travel
Behavior
Public
Health
Land Use
Socio-
Economic
Impacts
Seconds
Time Frame
Years

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

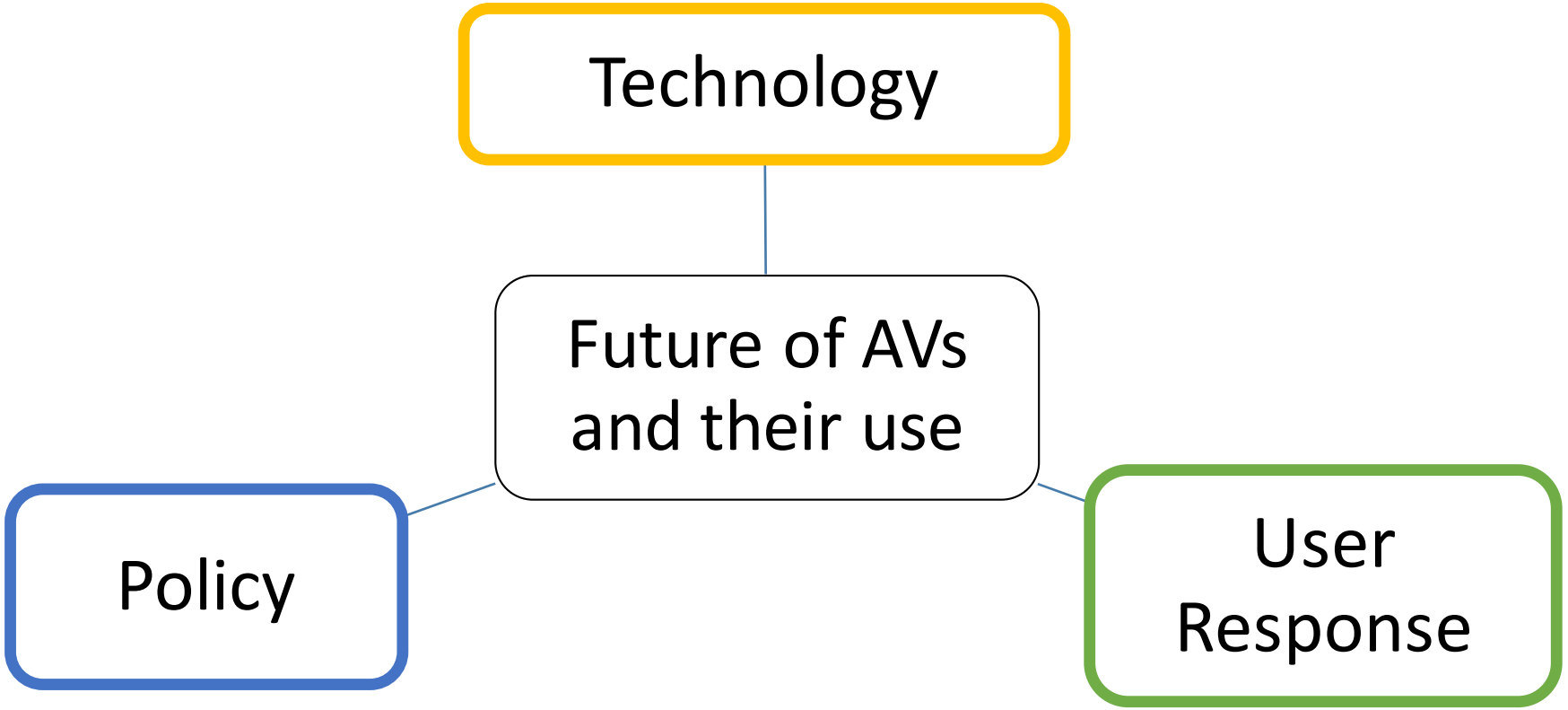
Examples

- ❑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



Thank you

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

www.its.dot.gov

Project Manager: Scott Smith
US DOT / Volpe Center
Scott.Smith@dot.gov
+1-617-494-2588

Program Manager: Kevin Dopart
US DOT / ITS JPO
Kevin.Dopart@dot.gov
+1-202-366-5004

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

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

Recommendations

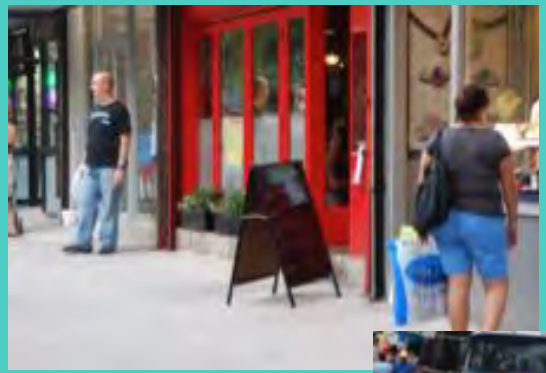
6. Think about **impact assessment** "from day 1"
7. Identify clear **performance measures** for automated services/ providers (local KPIs).
8. Clarify expectations on **users' cross-brand experiences** (or a uniform local brand?).
9. Involve **other municipal services** (e.g. waste collection, street 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.

Envisioning a Great Cities with AV Technology

NACTO

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?

U.S. Department of Transportation
Federal Highway Administration

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 cites 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

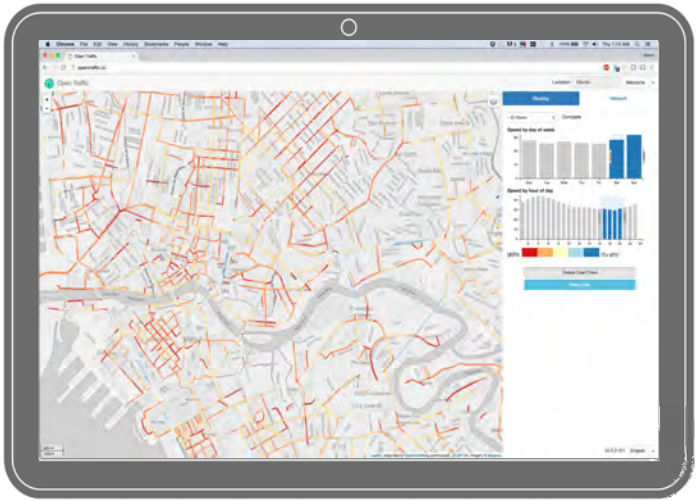
1. Improving Safety
2. Sharing Data
3. Expanding Transit
4. Democratizing the Curb

1. Improving Safety

1. Improving Safety

1. Improving Safety

Manage Streets in Real Time



CITY DATA SHARING PRINCIPLES: INTEGRATING NEW TECHNOLOGIES INTO CITY STREETS

VISION STATEMENT

Data is the foundation of 21st century transportation systems. As new transportation technologies rapidly emerge they create data streams with vital information for management, proactive planning, and policymaking. These data created on city streets must be available to cities in an accessible format in order to support sustainable, accessible, and affordable transportation.

NACTO's data sharing standards aim to facilitate better working relationships between cities and private transportation providers by elevating and standardizing the process of data sharing. These will enable more proactive, data-driven transportation planning solutions and allow private mobility providers to exchange data with cities in the most secure, cost effective, and efficient manner possible.

NACTO's data sharing standards set a path forward for:

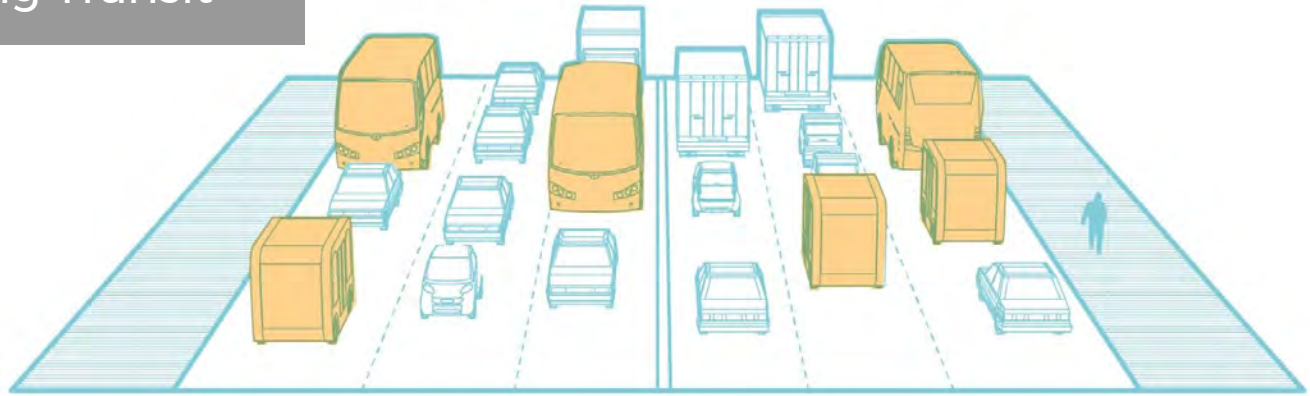
1. **Better Data for Transportation Planning**
2. **Inclusion in Mobility Options**
3. **Better Tools for Safety**

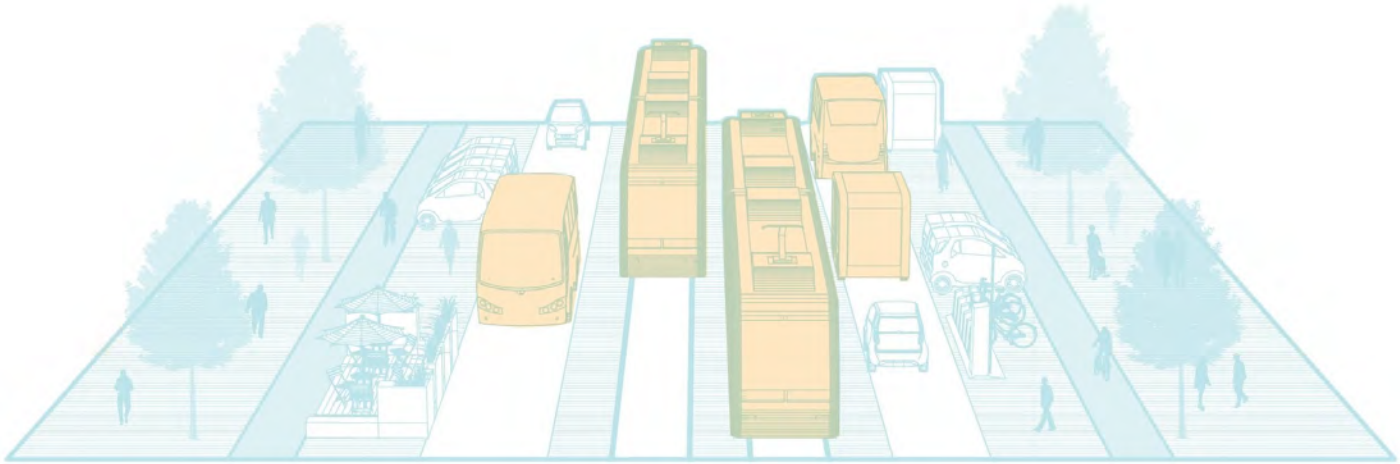
1. BETTER DATA FOR TRANSPORTATION PLANNING

Cities seek the best data to understand, manage, and maintain increasingly constrained transportation networks. This data comes from real time information about operations on city streets. New mobility providers and other GPS- or AVL-enabled fleets collect information that can provide unique insights to cities on the operation of their streets. Sharing of this data in an accessible, secure, and interoperable manner will allow cities to manage, maintain, and proactively plan based on accurate data. The following information should be available to cities from all mobility providers and fleets operating on city streets.

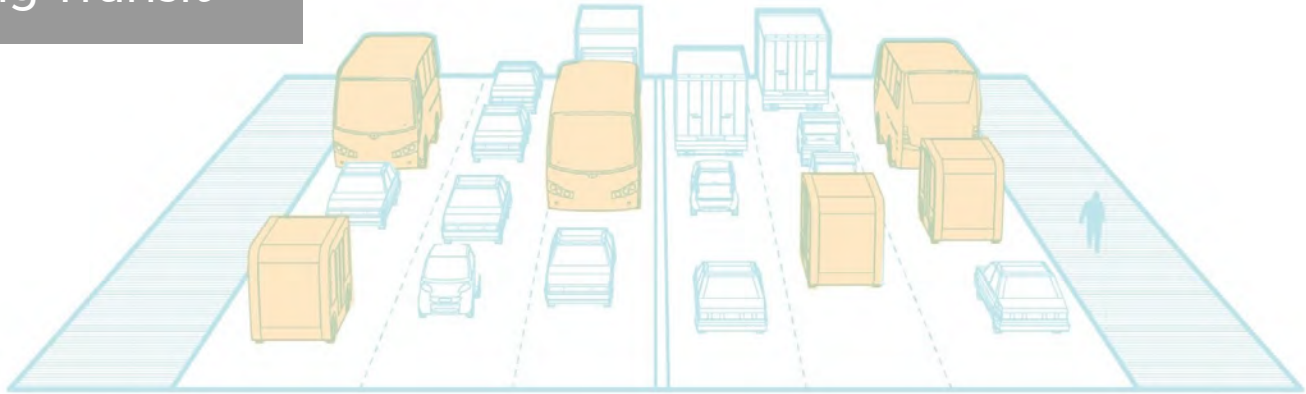
- **Manage City Streets:** Corridor level trip routing information including speed, travel time, and volume data is essential for better street management.
- **Manage Curb Space:** Curb space has become increasingly desirable among mobility providers in cities. Provision of information on pick-up and drop-off locations allows cities to properly allocate and dynamically manage curb space to prevent congestion and ensure safe operations on city streets.

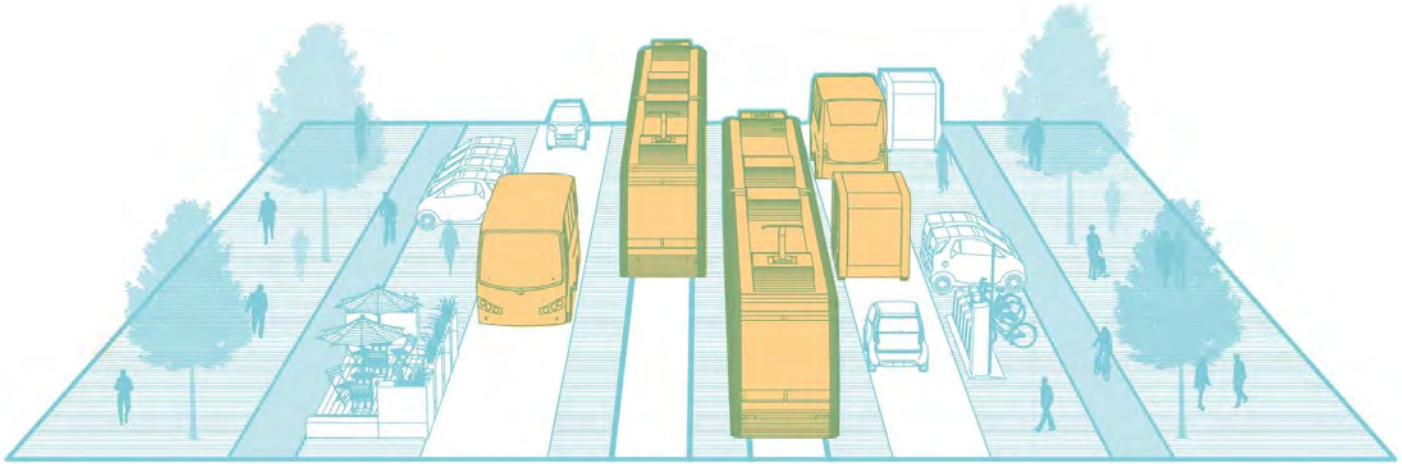
3. Expanding Transit



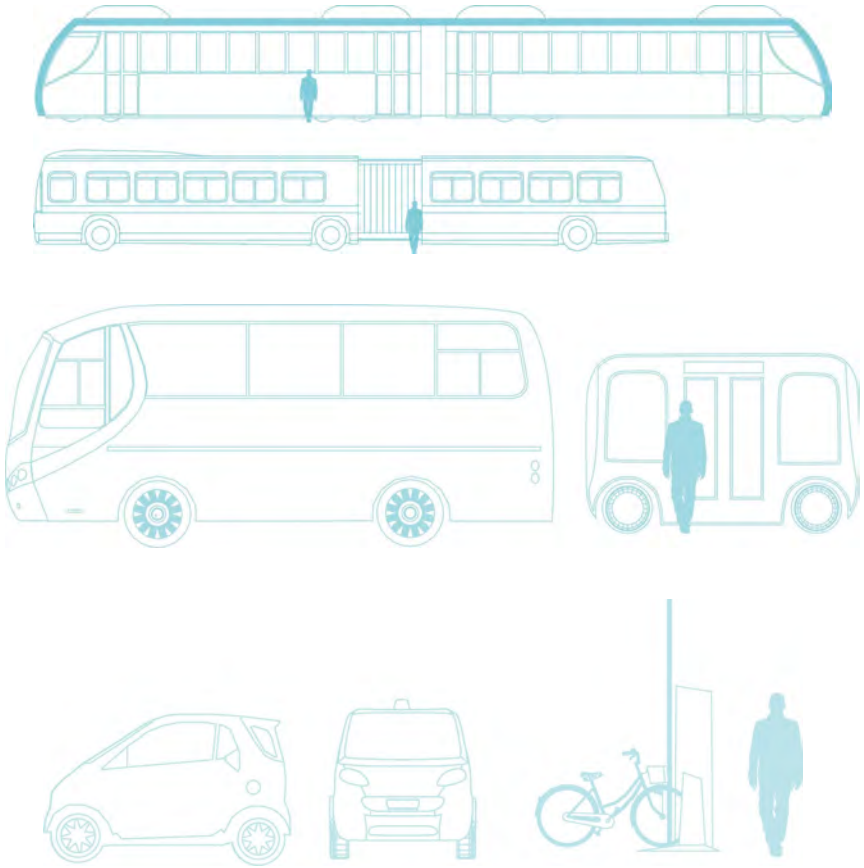


3. Expanding Transit

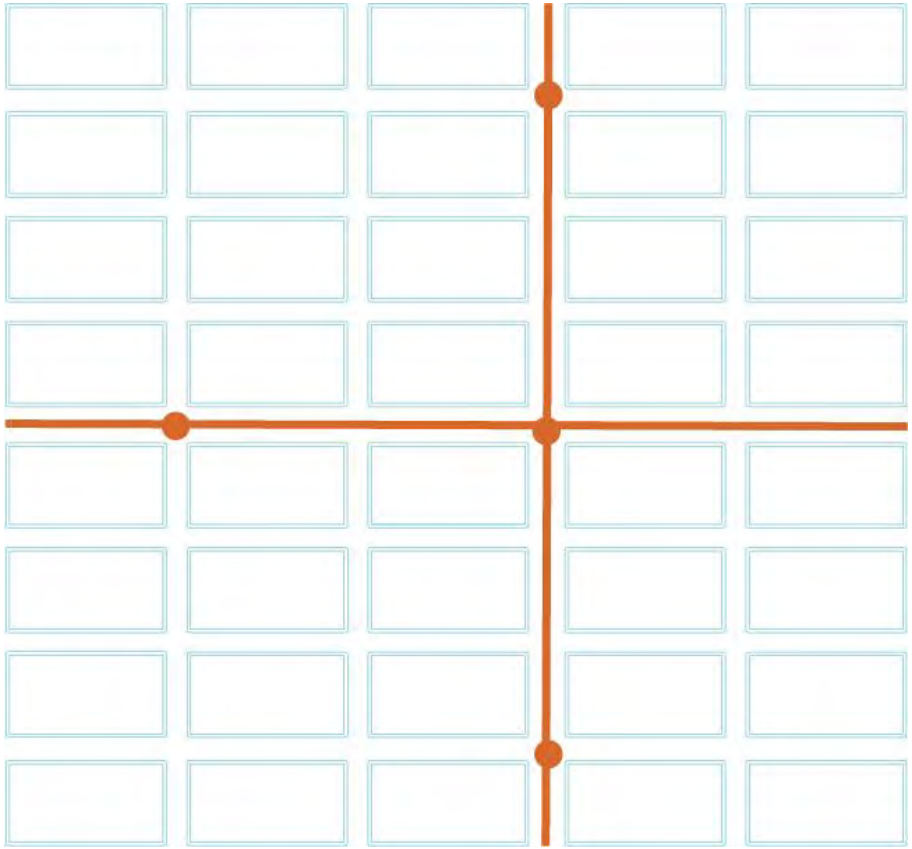




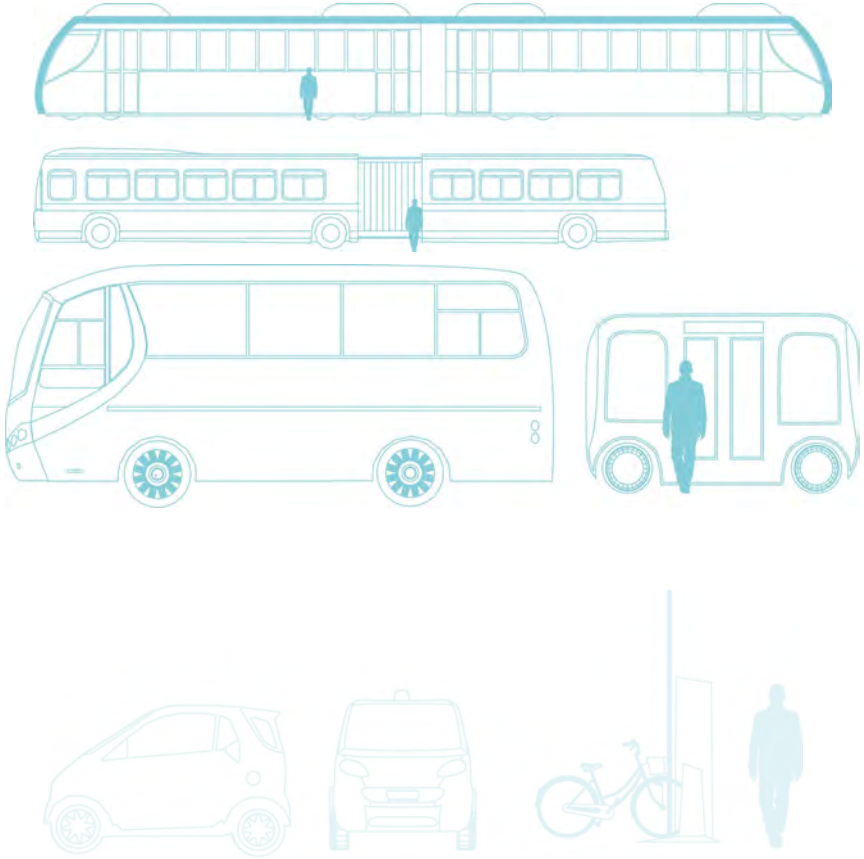
3. Expanding Transit



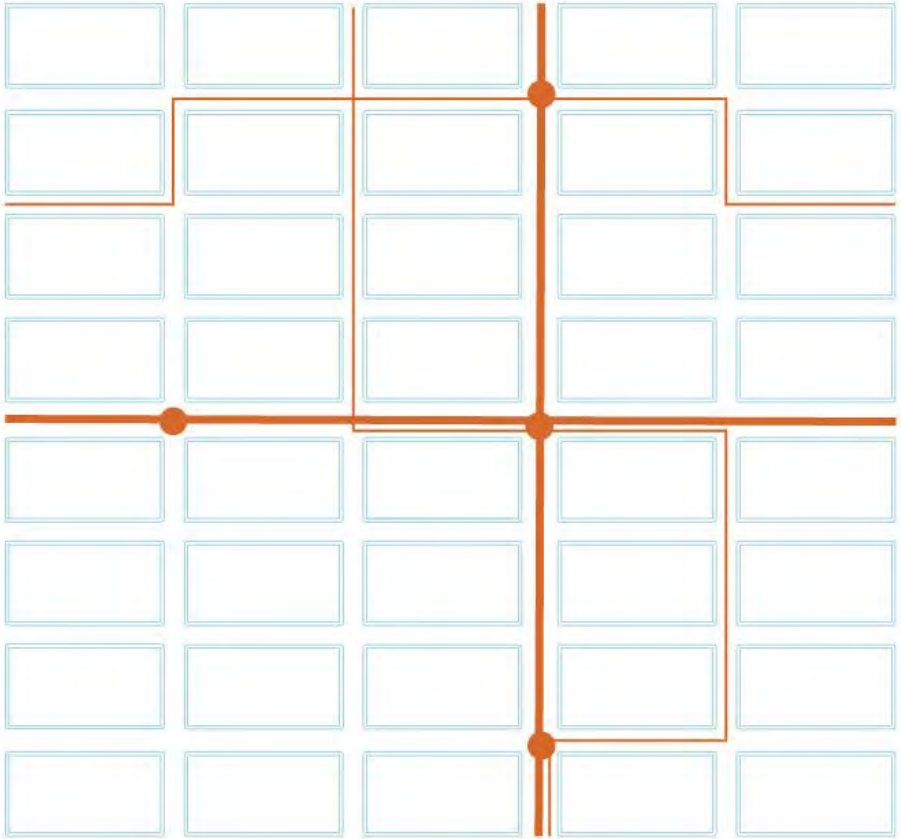
Focus on Fixed



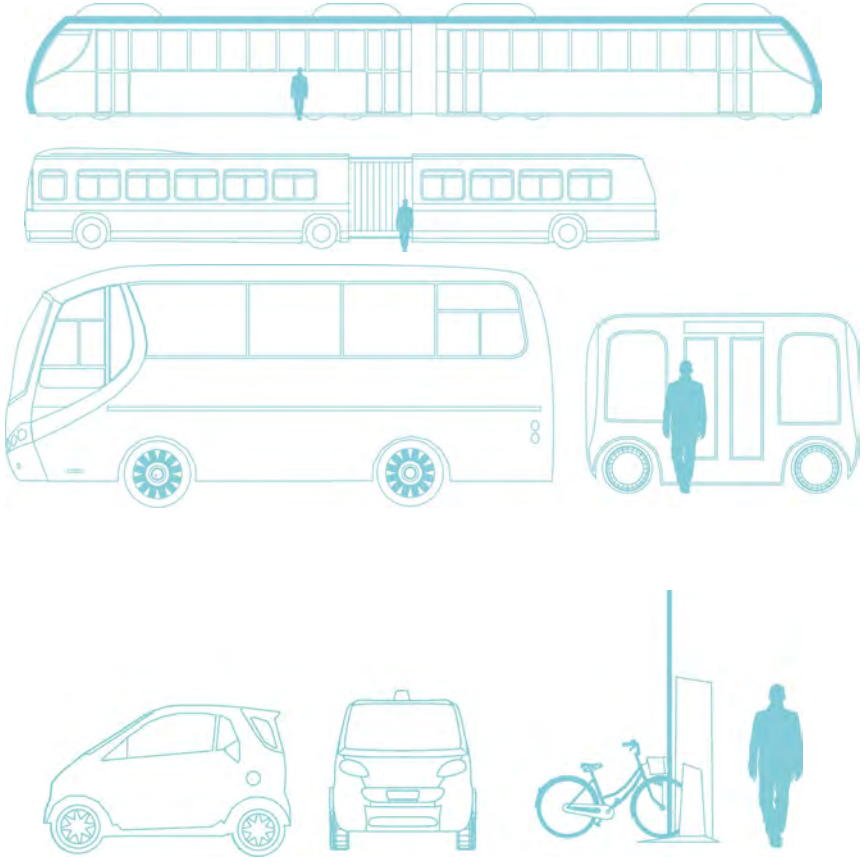
3. Expanding Transit



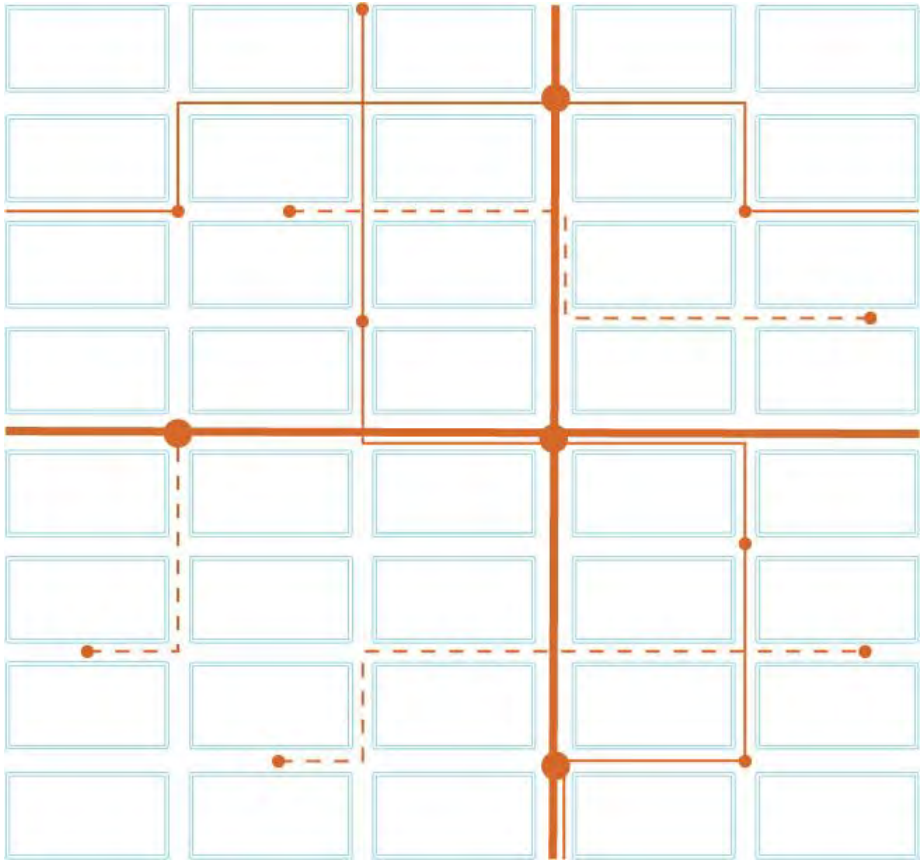
Flexible Route



3. Expanding Transit

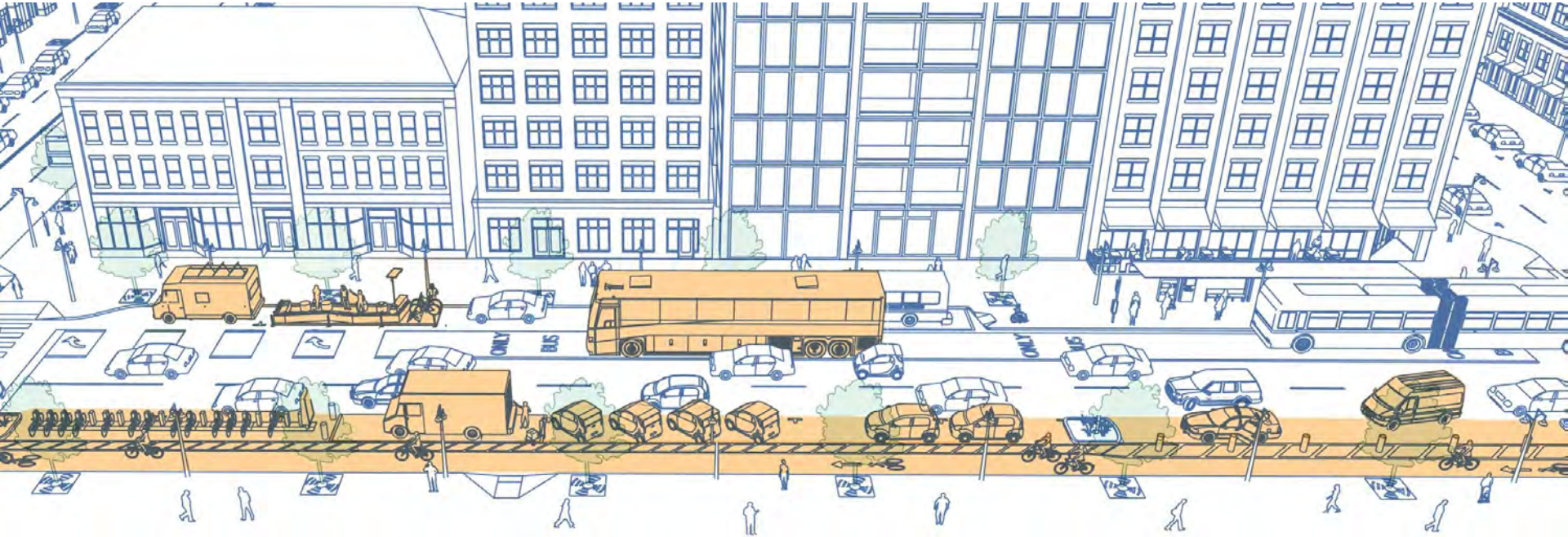


Point to Point



4. Democratizing the Curb

4. Democratizing the Curb



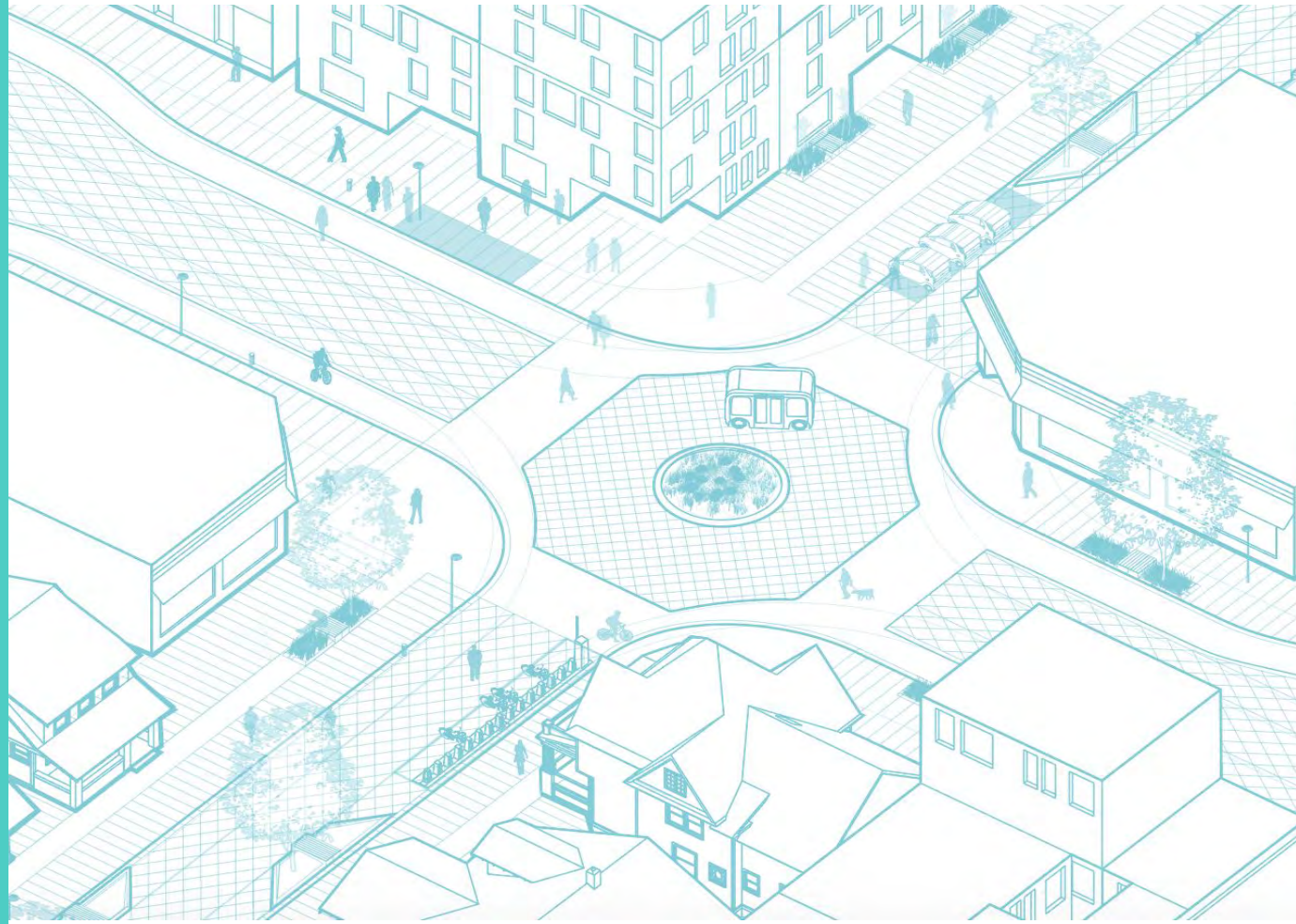
Making Automated Vehicles Work for Cities

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

mollie@nacto.org

NACTO

mollie@nacto.org



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?).
3. Get going. Follow a **light-weight, incremental approach**. Systematically build critical mass.
4. Manage (complex/ contradictory) **citizen expectations**. Communicate "It is innovation".
5. Keep an eye on the **business case**.