

How automation may change the shape & form of cities

Dr. Jaap Vreeswijk, *MAP traffic management*

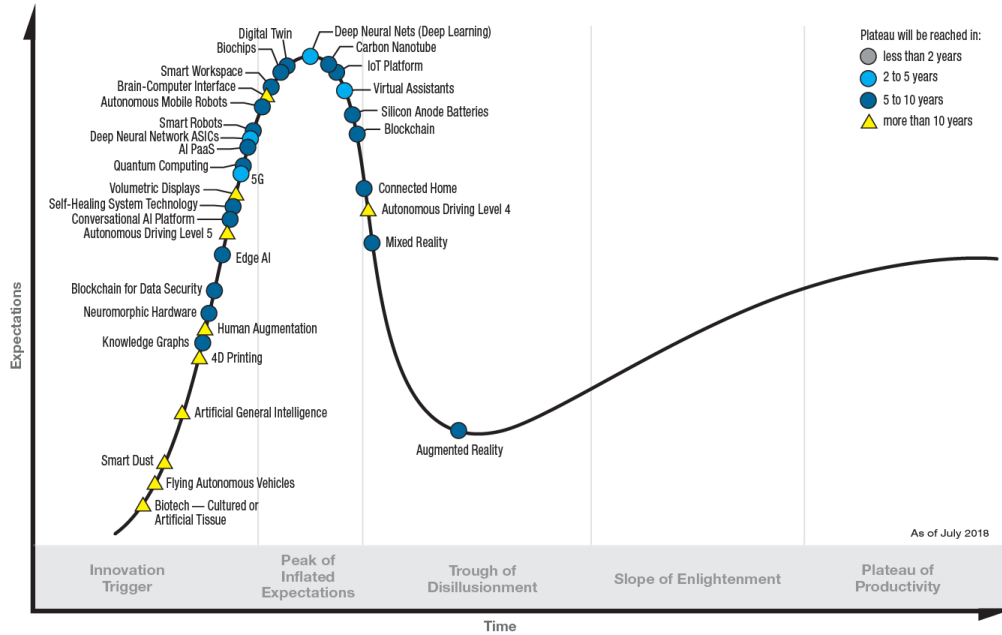
MAVEN stakeholder workshop, 24 October 2018, Greenwich (London)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690727



Hype Cycle for Emerging Technologies, 2018

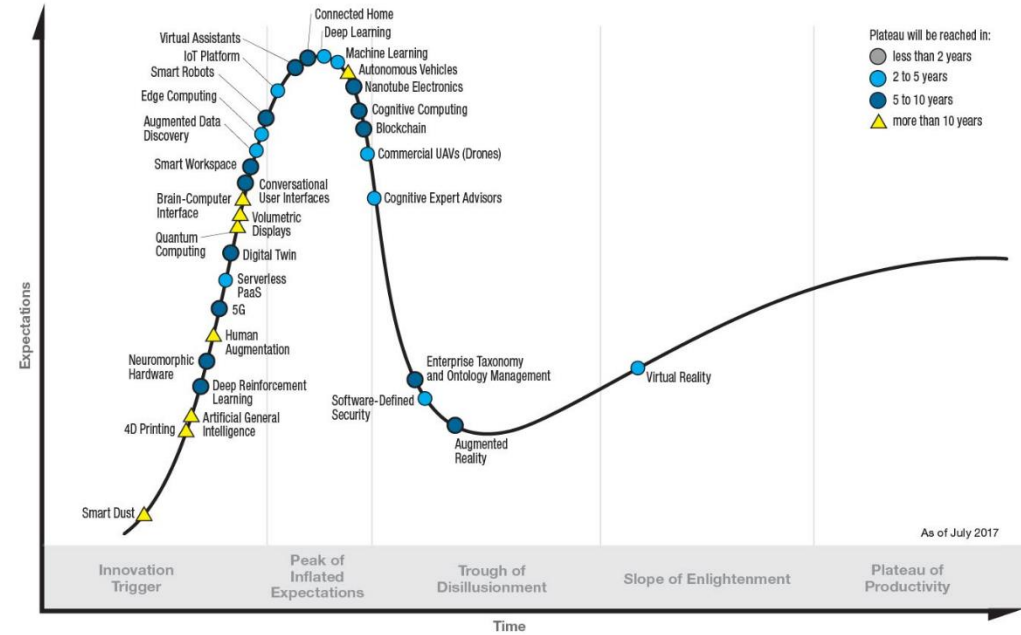


gartner.com/SmarterWithGartner

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Gartner

Gartner Hype Cycle for Emerging Technologies, 2017



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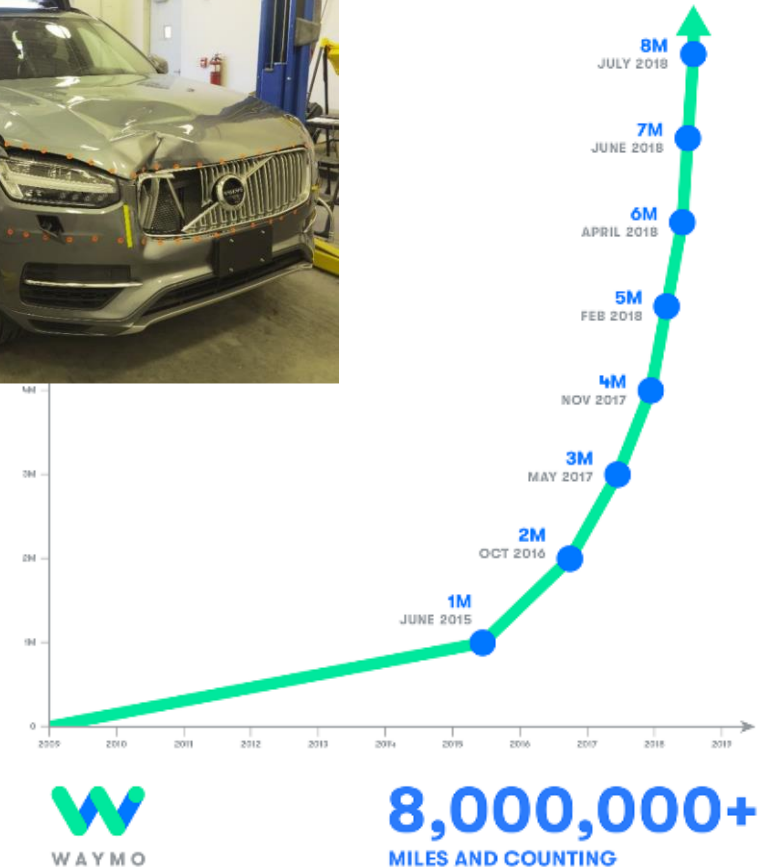
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Significant developments in past 12 months

Some highlights from the 22nd annual meeting of the International Task Force on Vehicle-Highway Automation

- Falling of the Gartner Hype Cycle.
- Automakers embracing business model of MaaS, setting up mobility divisions targeting robotaxi-type transport systems.
- Number of autonomous platform developers coming to market.
- Rise of truck automation: new start-ups, significant investment.
- Trials around the world involving Level 3 automation and above.
- Uber fatal crash in Arizona alerting everybody not to take safety for granted.
- Greater recognition that it is a tedious process to bring AD systems to the market safely.
- Various regulations in place or under development to facilitate automated driving.



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Market activity

Passenger car

- Adaptive Cruise Control, Lane Centring (“almost L2”) widely available in premium vehicles
- 2020: L2 street automation
- 2025: L4 highway automation

Truck

- Commercial deployment of platooning 2018
- Commercial deployment of driverless yard trucks 2019
- Commercial deployment of highway “driverless” soon (depends on regulatory update)
- Mostly L1, follower in some cases L2 to experimental L4
- Exit-to-exit model

Robotaxi

- Significant upswing in deployment and user base within 5 years
- 13 out of 16 passenger car manufacturers active
- People movement and last mile delivery
- 2019: GM, Peugeot
- 2020: Nissan, Toyota
- 2021: BMW, Ford, Volkswagen
- 2023: Mercedes



Lyft: “hybrid approach”

1 Where to drive: know the best routes

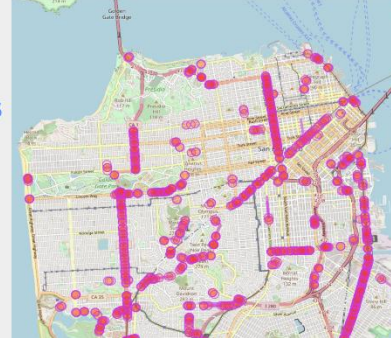
Lower speeds, limit complex situations & traffic restrictions

- Speeds ≤ 35 MPH
- Avoid difficult intersections
- No bike lanes
- Well-marked roads
- Easy pick-up and drop-off

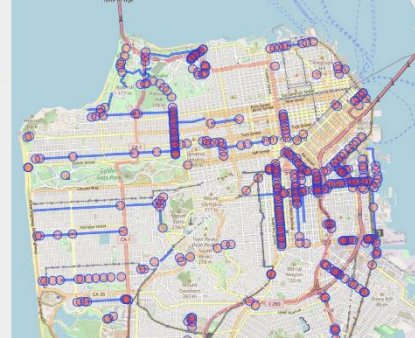


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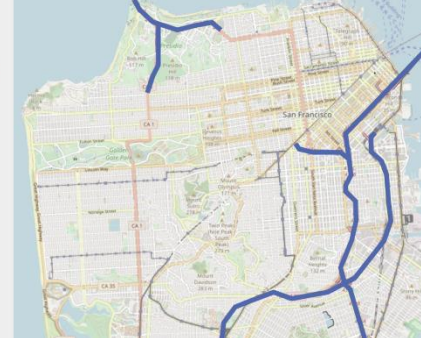
Remove
Difficult
Intersections



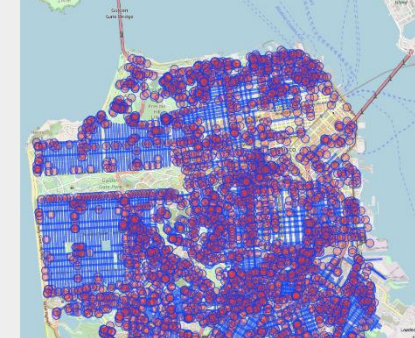
Remove
Bike Lanes



Remove
Highways



Remaining
Routes:
“AV Eligible”



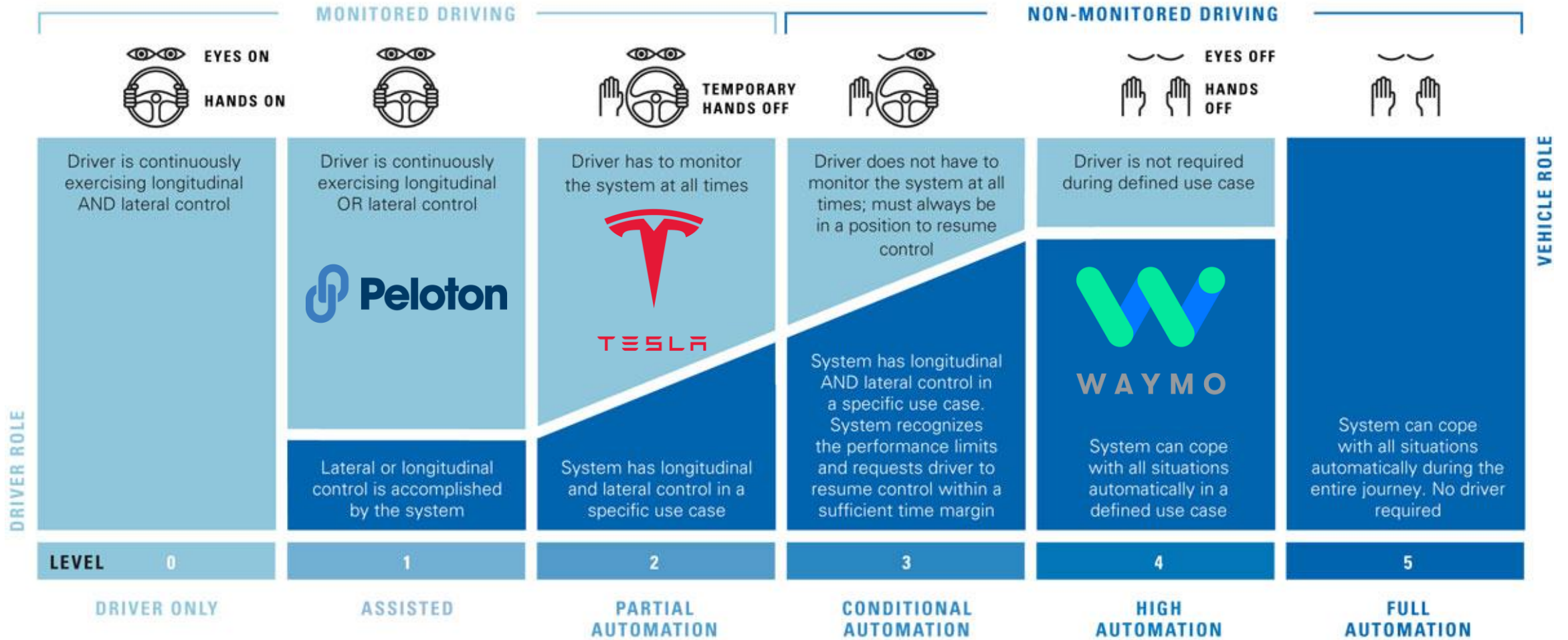
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http://auvsilink.org/AVS2018/Plenary/0930-0945_Tue_Nadeem_Sheikh.pdf

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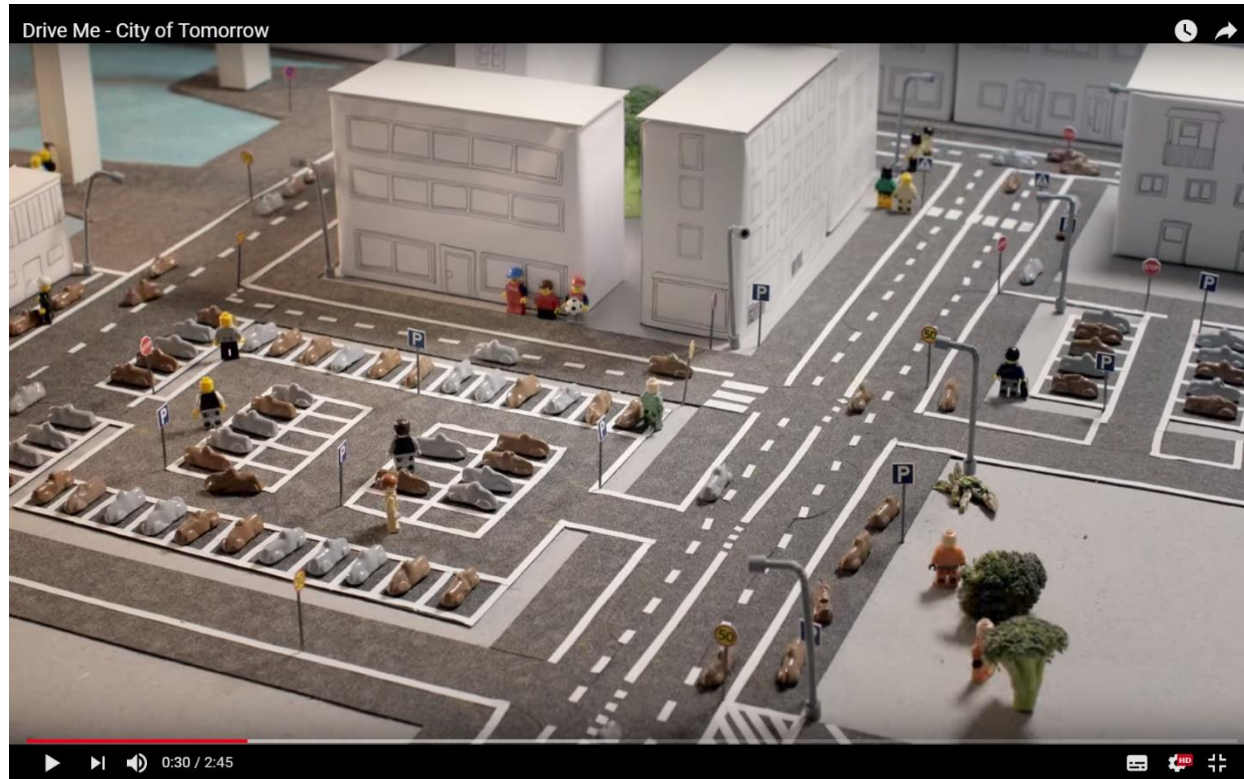


Mike Lemanski

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How will automation change cities?



https://www.youtube.com/watch?v=EMD_0SjzTcA

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Impacts of automated driving

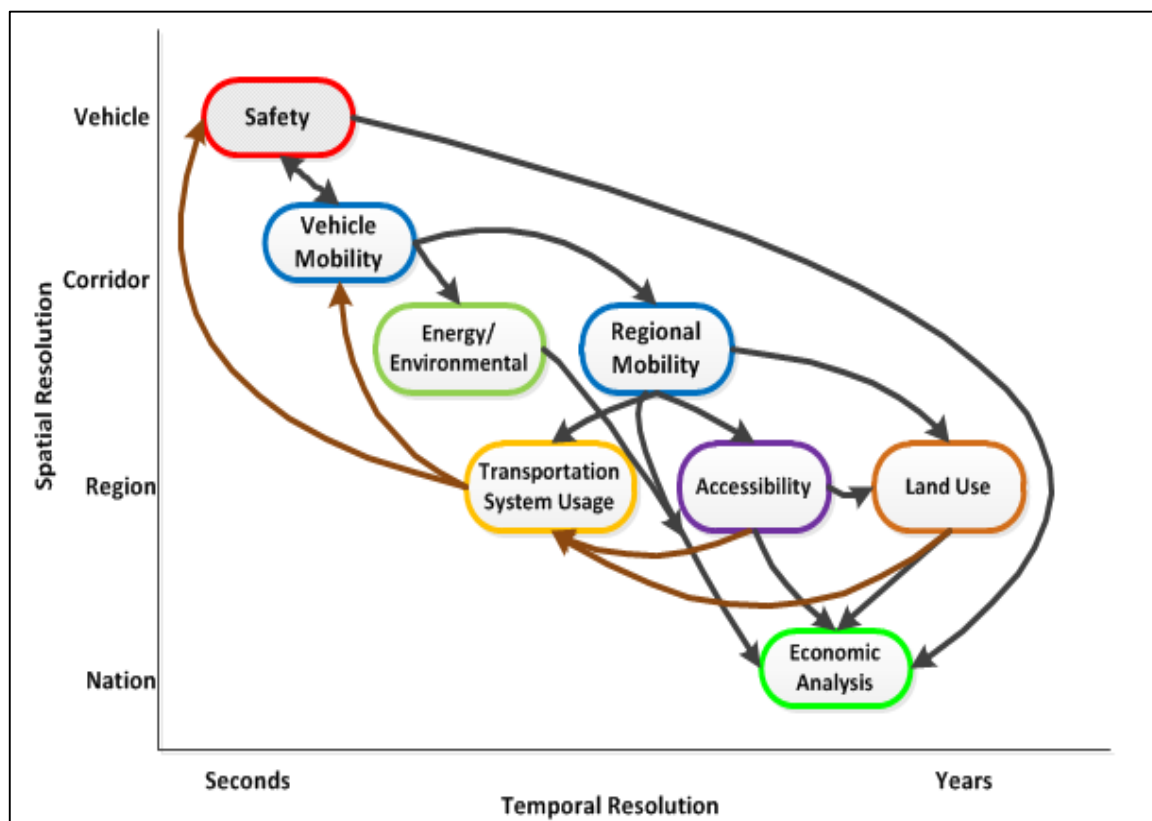
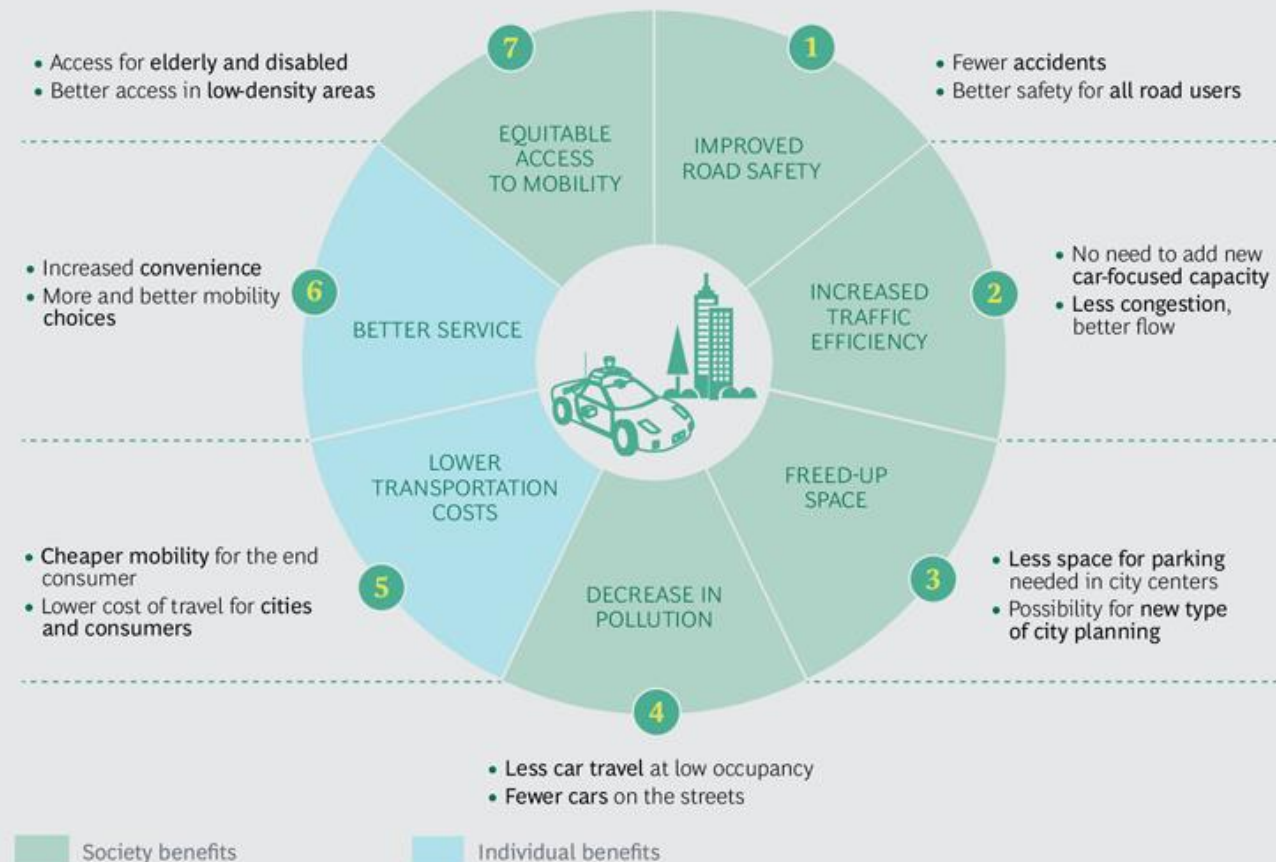


EXHIBIT 9 | Policymakers See Widespread SDV Benefits for Both Individuals and Society



Sources: City interviews, Q3 2015; World Economic Forum; BCG analysis.

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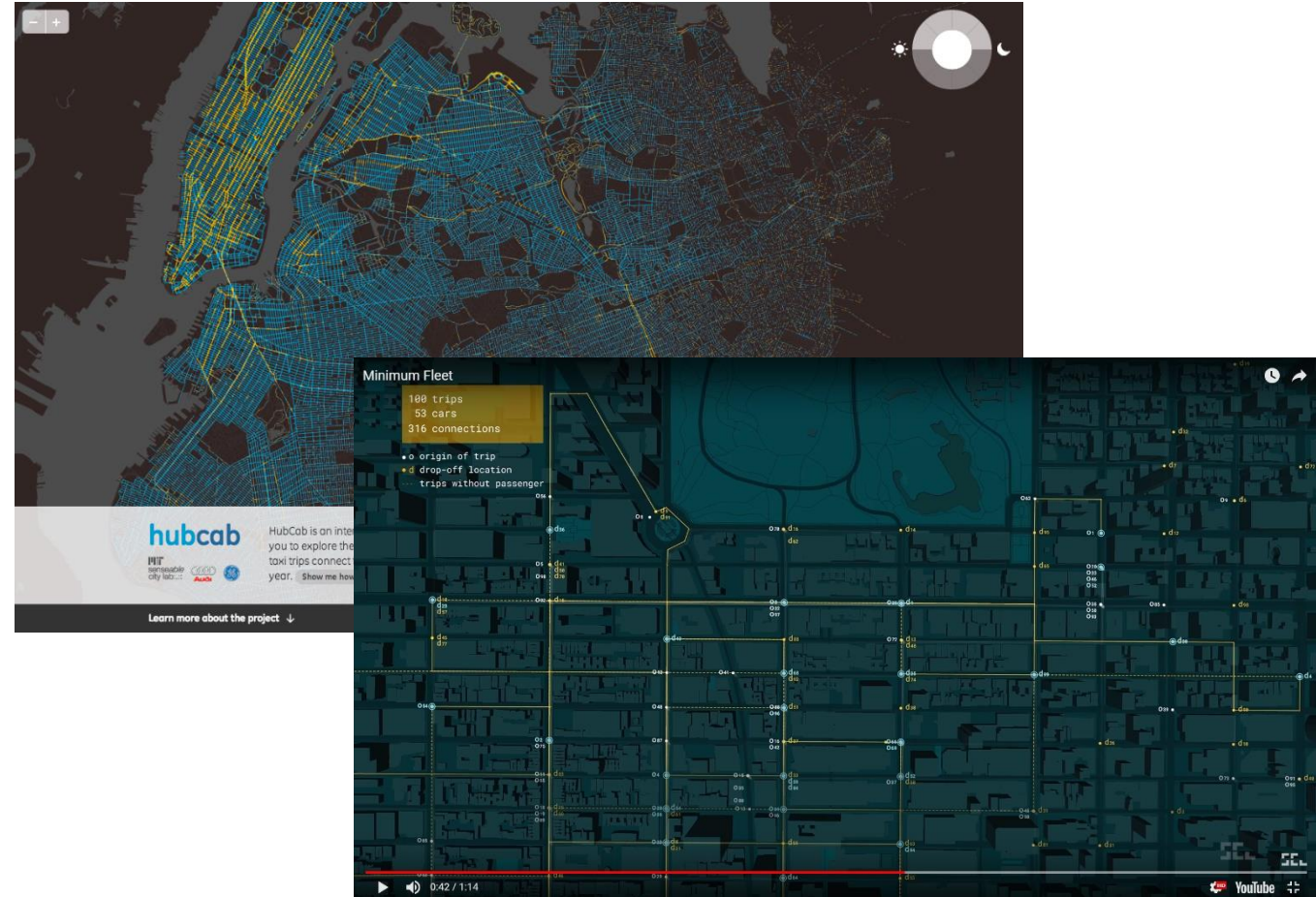
<https://www.bcg.com/publications/2016/automotive-public-sector-self-driving-vehicles-robotaxis-urban-mobility-revolution.aspx>

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Potential of sharing: the shareability spectrum

- Study based on 150 million taxi trips (NYC).
- Each ride shareable with 100 other rides.
- Theoretical optimum: half the fleet size, 40% less trips, nihil extra waiting.
- Replicated Singapore, SFO and Vienna.
- Not density, but similar daily mobility patterns among area residents dominant.



<http://news.mit.edu/2018/minimum-vehicle-fleet-rider-demand-0523>

<https://www.sciencedaily.com/releases/2017/03/170306092719.htm>

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"The Boston Study" - Understanding consumer adoption of AVs

Mass transit

Bus/subway



Commuter rail



Personal car

Personal car



Autonomous personal car



Mobility-on-demand

Taxi/ride-hailing



Autonomous shared taxi



Autonomous taxi

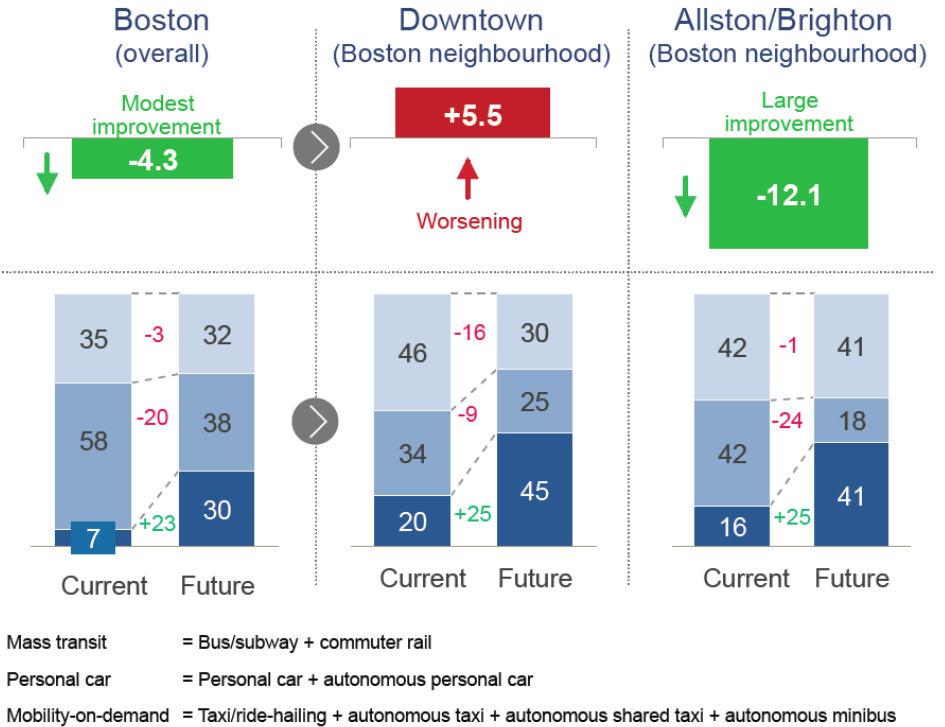


Autonomous minibus



% change in average travel time

Modal mix %



<https://www.weforum.org/agenda/2018/06/autonomous-vehicles-could-clog-city-centres-a-lesson-from-boston/>

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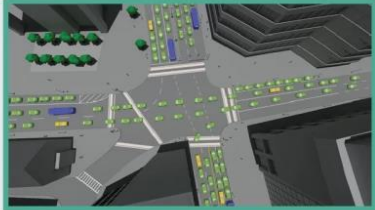
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“The Boston Study” – potential effects on traffic

EXHIBIT 2 | Two Change Scenarios: Evolutionary Versus Revolutionary

BOSTON TODAY¹



Primary transport mode

% of trips

- Public transit 56
- Traditional personal vehicle 33
- Traditional taxi and ride hailing 11



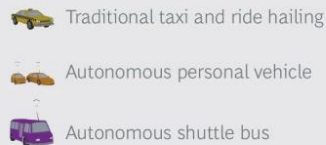
SCENARIO A: Gradual shift from private to shared and from human-driven to AV



Primary transport mode

% of trips²

- Public transit 50
- Shared autonomous taxi 22
- Autonomous personal vehicle 11
- Traditional personal vehicle 11
- Traditional taxi and ride hailing 6



SCENARIO B: Disruptive shift from private and human-driven to shared and AV



Primary transport mode

% of trips

- Public transit 34
- Autonomous shuttle bus 28
- Autonomous taxi 24
- Shared autonomous taxi 14

Sources: World Economic Forum; BCG analysis.

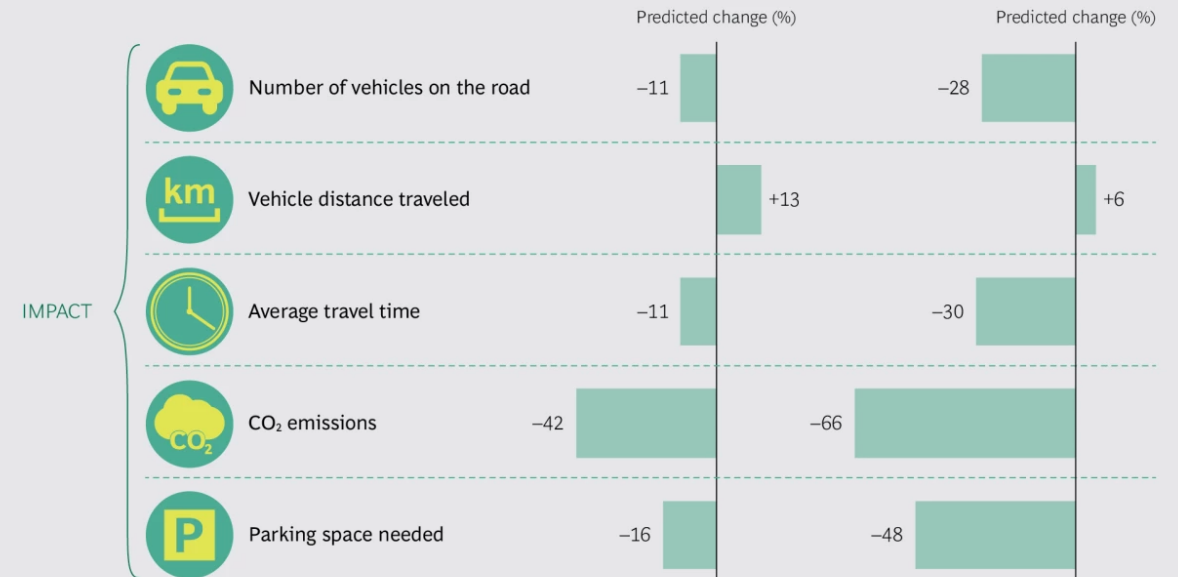
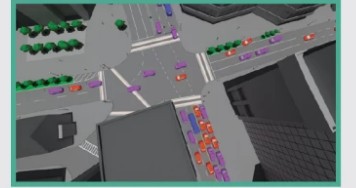
¹This mix of transportation modes is representative of the study area only. Most trips into and out of the study area are work commutes. The model assumes a simplified modal mix without walking and cycling.

EXHIBIT 3 | Both Change Scenarios Showed Less Congestion, Lower Emissions, and More Street Space

SCENARIO A: Gradual shift from private to shared and from human-driven to AV



SCENARIO B: Disruptive shift from private and human-driven to shared and AV



Sources: World Economic Forum; BCG analysis in cooperation with MIT Media Lab.



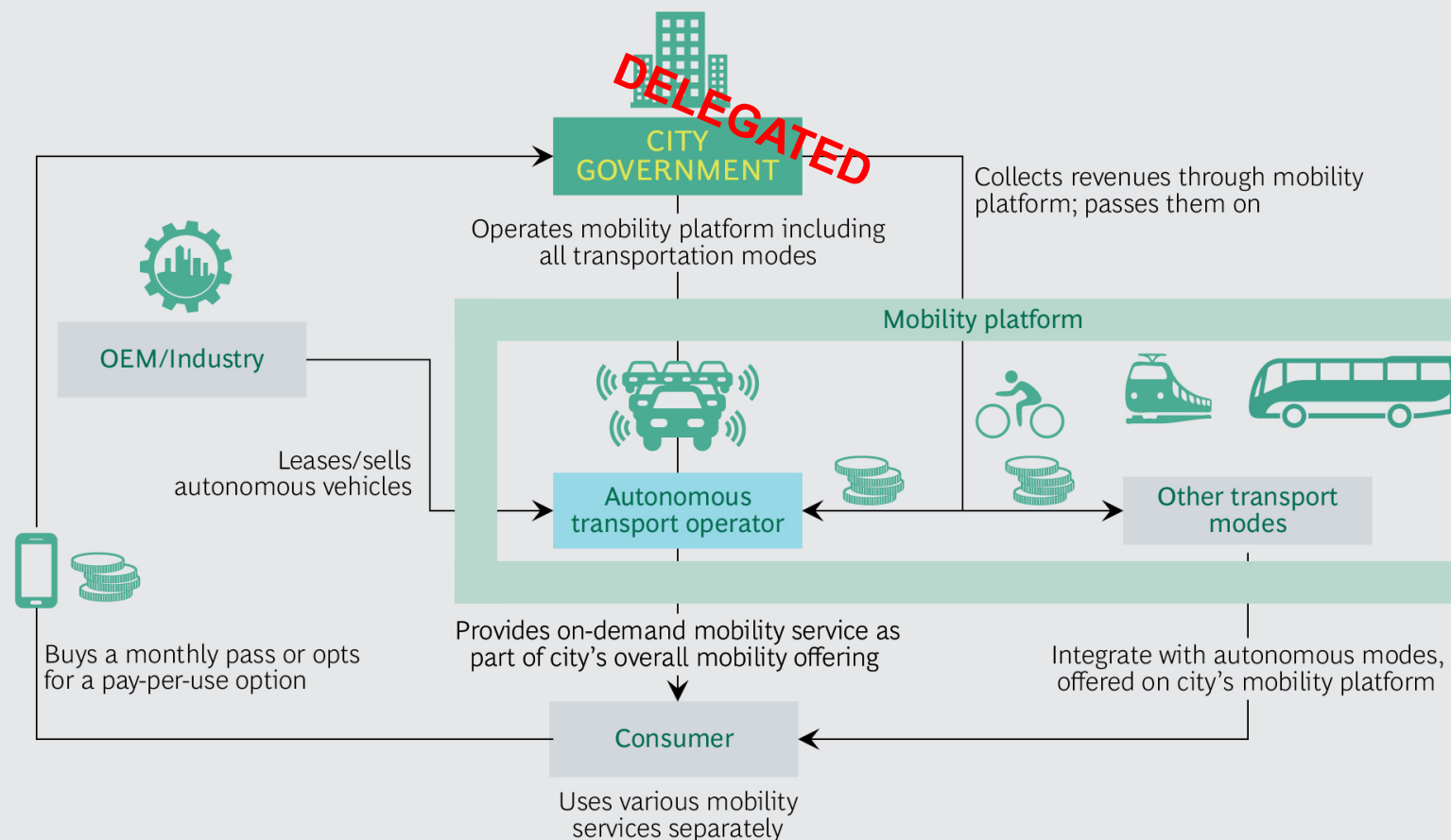
<https://www.bcg.com/publications/2017/automotive-making-autonomous-vehicles-a-reality.aspx>

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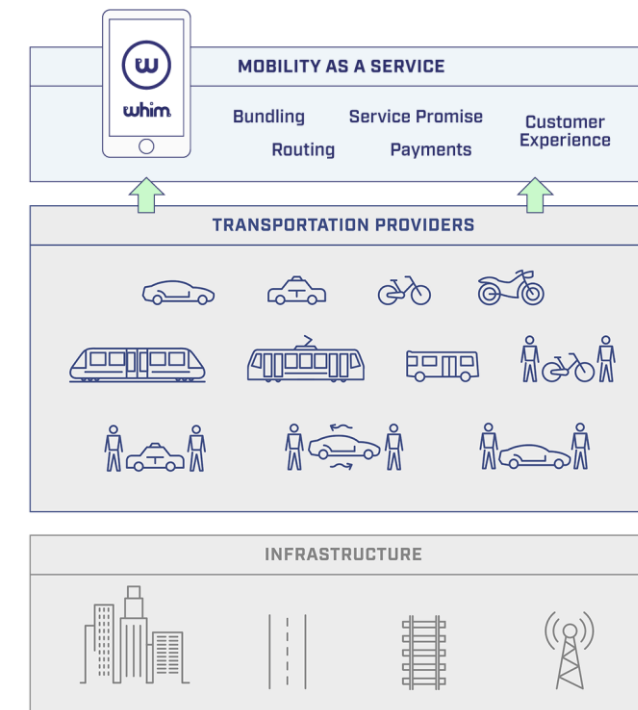


“Cities must take ownership today of managing their future mobility ecosystem”

EXHIBIT 4 | How Cities Envision an Integrated Citywide Mobility Platform



Sources: World Economic Forum; BCG analysis.



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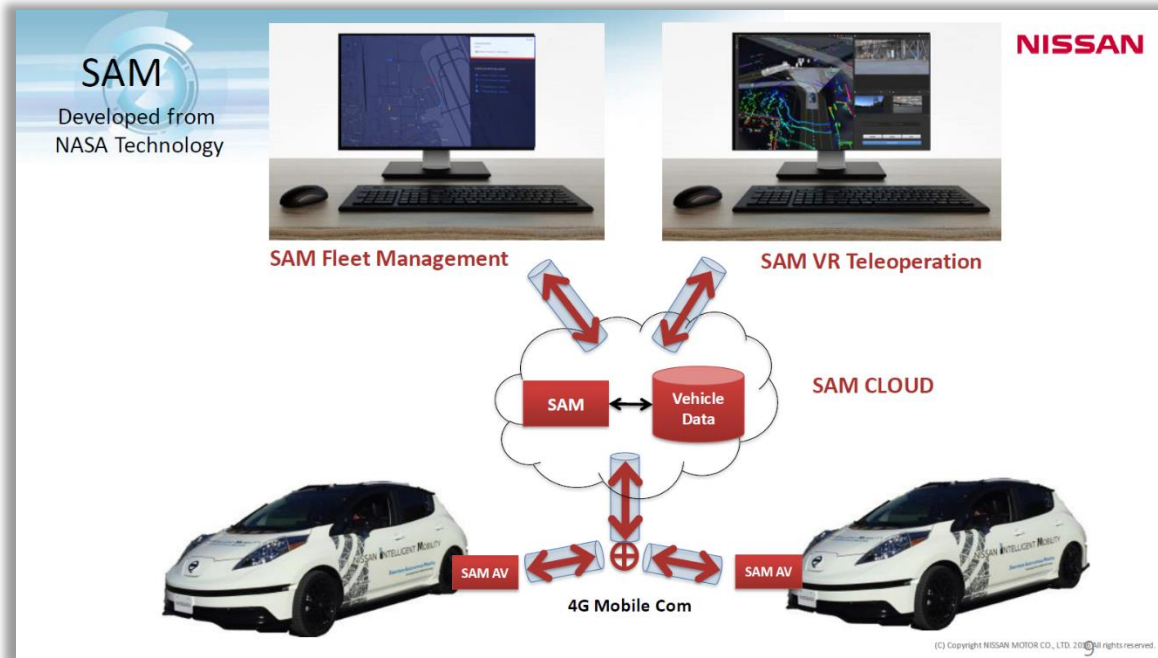
<https://www.bcg.com/publications/2017/automotive-making-autonomous-vehicles-a-reality.aspx>

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Remote fleet support to build confidence

- If a driverless vehicle becomes confused, lacks the data to keep driving (construction, weather, smoke, etc.) vehicle will stop in-lane and ask for help.
- Human operator “in the Cloud” views situation and provides a new path to vehicle, thereafter the vehicle drives itself.



<http://www.automatedvehiclessymposium.org/avs2018/2017-highlights/2017proceedings>

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Roughly 90% of city policy makers said that they would rather have multiple private-sector entities offering new, autonomous mobility services than rely on the city or on a single private provider. Any third-party mobility offering, however, would need to conform to the city's critical planning goals.

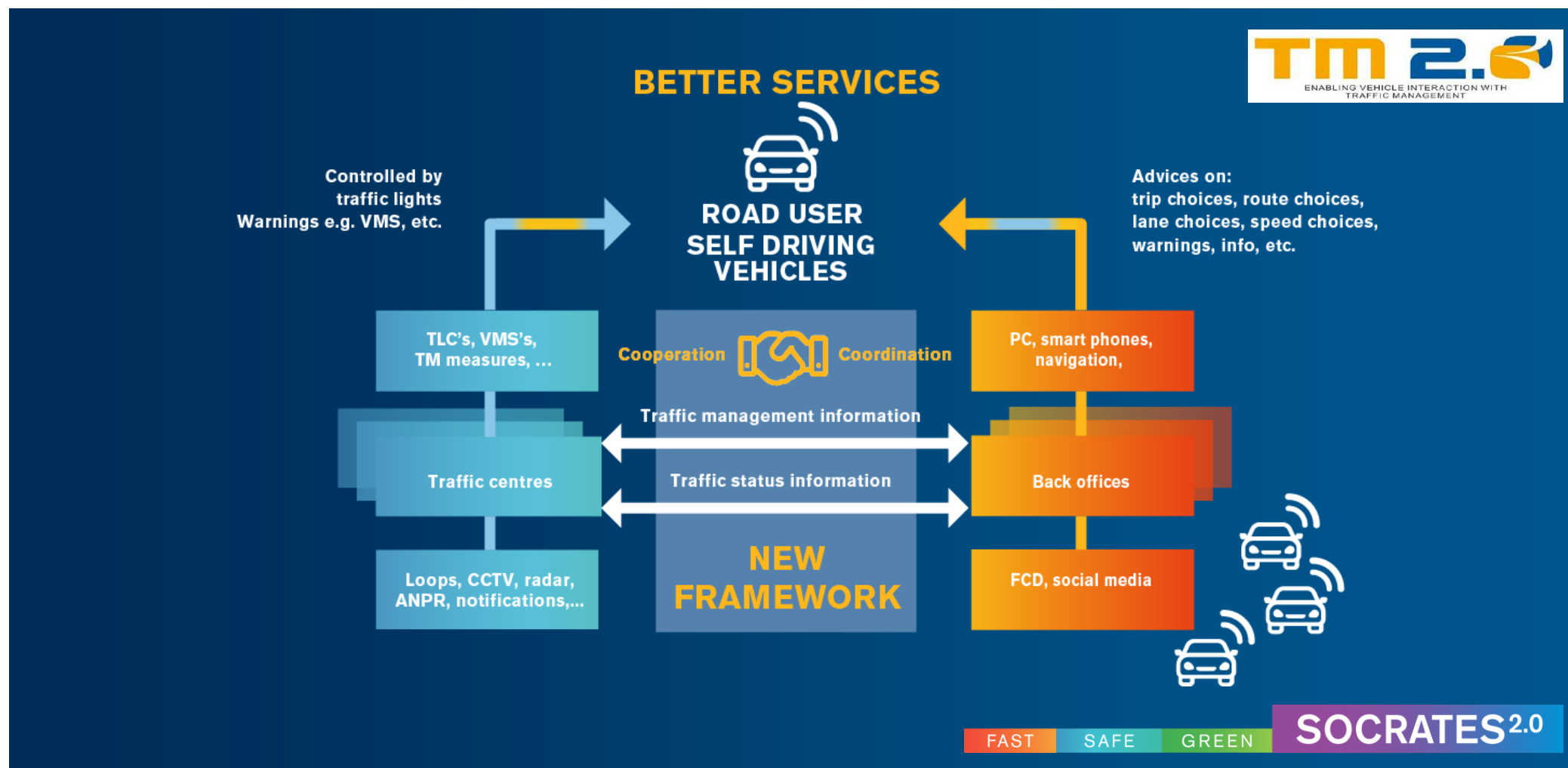


<https://www.bcg.com/publications/2016/automotive-public-sector-self-driving-vehicles-robotaxis-urban-mobility-revolution.aspx>

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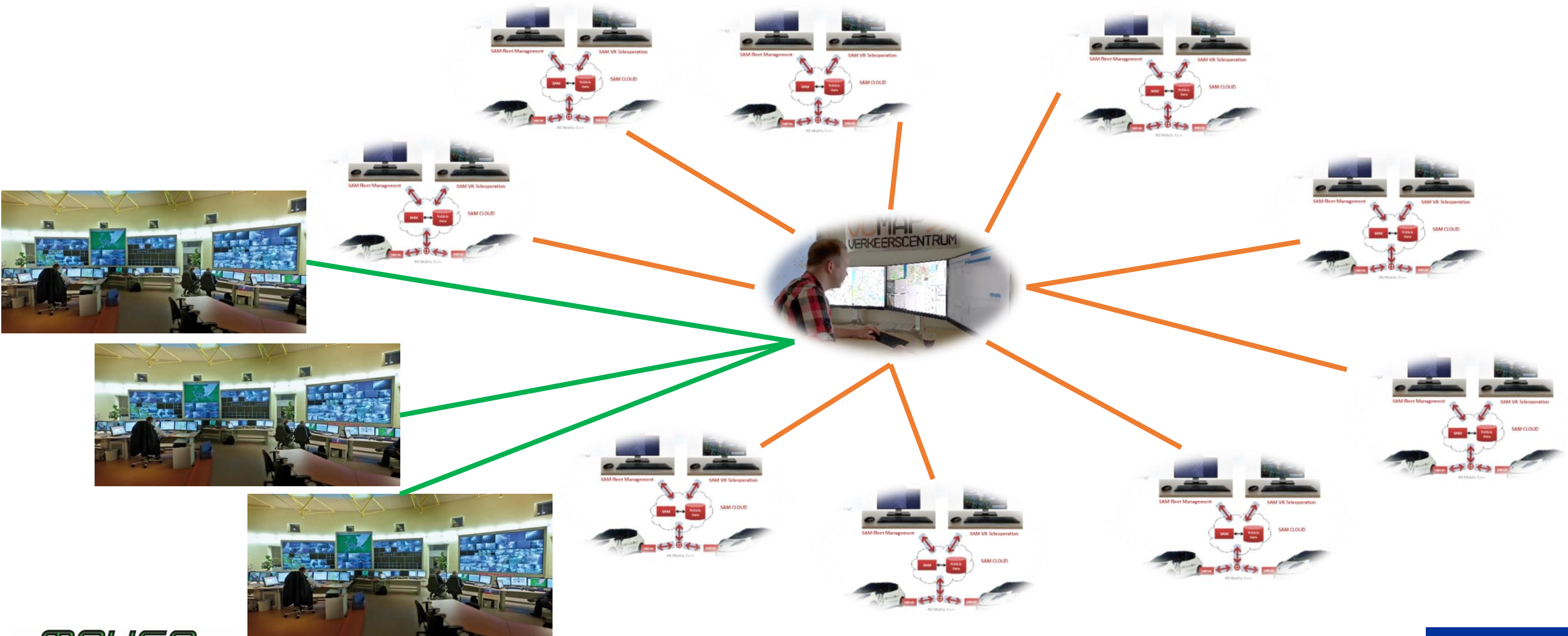
Interactive traffic management



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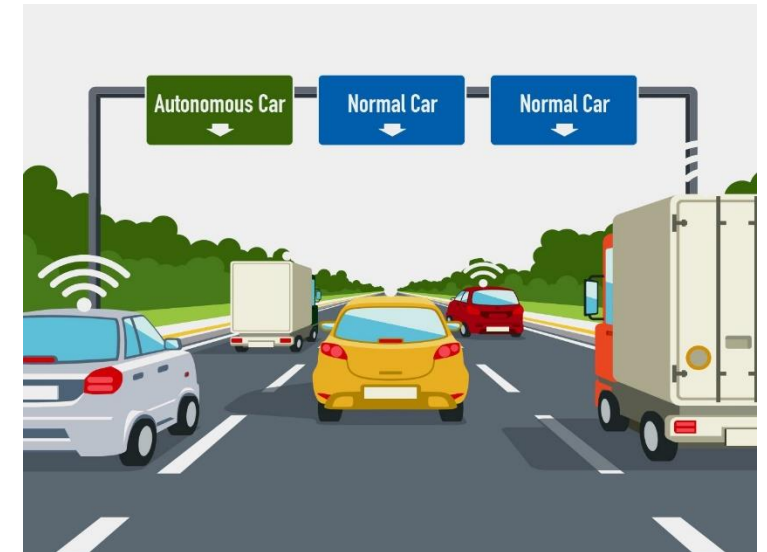


Upscaling and replicability (1..n): delegated traffic centre(s)



Traffic flow use cases: worth another look?

- Transportation network companies (TNC's), robotaxi developers and the rise of cloud connected vehicles offers new openings to successfully deploy connectivity to improve traffic flow.
 - **Speed Harmonisation:** drivers / vehicles responding to precise speed advisories generated by TMC.
 - **Dynamic Lane Assignment and Lane-Change Advice** at bottlenecks.
 - **Coordinated movement** of large concentrations of vehicles to stabilise / improve traffic flow.



Autonomous and Helpless in Traffic: How do we truly gain the benefits of autonomous mobility? Richard Bishop, September 11th 2018

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Summary

- Significant development over past year.
- Lot of market activity, mainly trucks and robotaxis.
- Many expected, calculated and extrapolated impacts of automation (how to unlock them?).
- There are consequences, limitations and policy challenges.
- New roles both public and private in managing the future mobility system.

- Recommendations to cities:
 - Adopt an agile development approach.
 - Engage in test activities to learn from field experiences.
 - Coordinate with city and state (or provincial) public-sector leaders.
 - Work with multiple private sector leaders to foster innovation.
 - Socialize innovative ideas early.



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Thank you for listening!

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MAVEN stakeholder workshop, 24 October 2018, Greenwich (London)

jaap.vreeswijk@maptm.nl | +31 6 4164 7985



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