Automated Vehicles in Europe – Cui bono?

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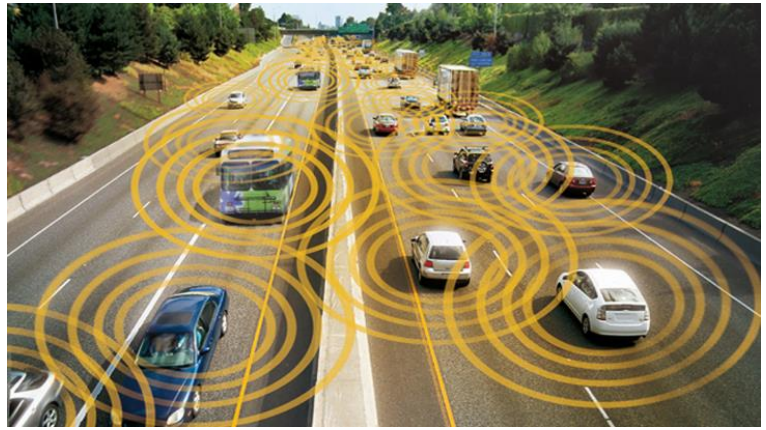

Session 4 A:
AUTOMATION IN CITIES AND REGIONS
Brussels, 7th of December 2017

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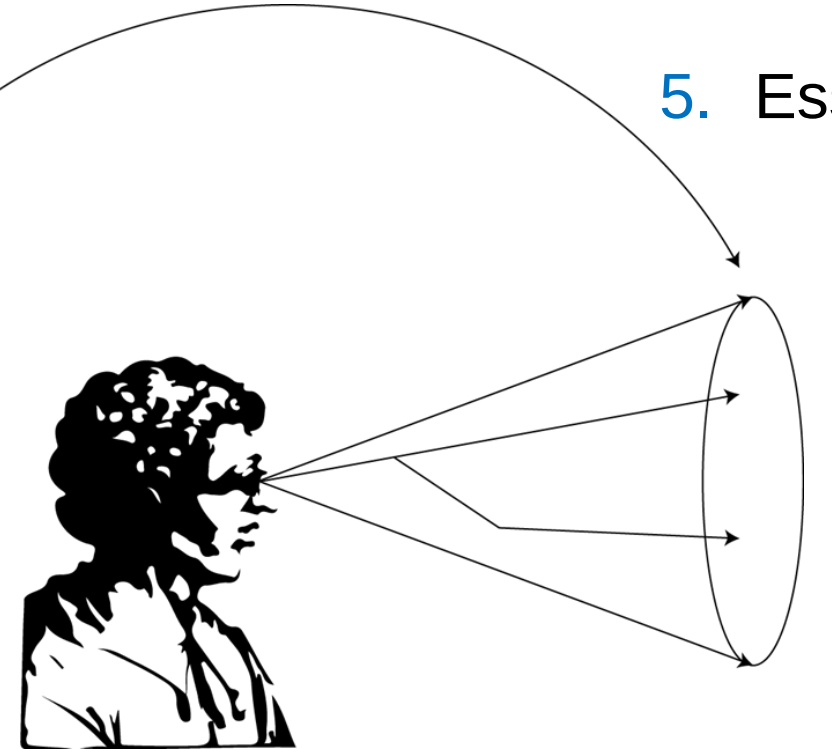

* AVENUE 21 – Autonomer Verkehr: Entwicklungen des urbanen Europa, is sposored by Daimler and Benz Foundation (11/2016-10/2018)

Use cases – what are we talking about?

Public transport and shared mobility

1. Mini-Pods
2. Autonomous Shuttle
3. Personal Rapid Transit / Autonomous People Mover
4. Automated bus
5. Automated bus on demand
6. AV Pod Car (ride hailing) (UBER)
7. AV collective Pod Car (ride hailing)

Individual traffic

8. Highway assistance with ‘driver on demand’
9. Automated valet parking
10. Low-Speed cruising
11. Fully automation with ‘driver on demand’
12. Vehicle-on-demand

Goods traffic

13. Warehouses logistic
14. Logistic systems in specific areas (harbours, factories, logistic hubs)
15. Platooning
16. Assisted highway trucking
17. Last-mile delivery (within cities)
18. Automated delivery systems

Use cases – what are we talking about?

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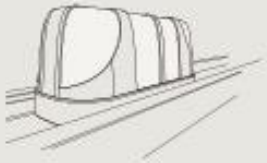
Autonomes Shuttle

- **Fahrzeugnutzung:** geteilter Raum
- **Antriebsarten:** wahrsch. Elektro
- **Geschwindigkeit:** max. 19–29 km/h
- **Platzangebot:** 15

Automatisierung des bestehenden ÖV-Angebots



- **Fahrzeugnutzung:** geteilter Raum
- **Antriebsarten:** Elektro
- **Geschwindigkeit:** 40–70 km/h
- **Platzangebot:** 24

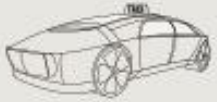
Automatisierung des bestehenden ÖV-Angebots

- **Fahrzeugnutzung:** geteilter Raum
- **Antriebsarten:** Benzin/Diesel/Elektro
- **Geschwindigkeit:** max. 70 km/h
- **Platzangebot:** 80

Autonomes Taxi/ Pod Car

- **Fahrzeugnutzung:** privater Raum
- **Antriebsarten:** wahrsch. Elektro
- **Geschwindigkeit:** max. 24 km/h
- **Platzangebot:** 2

Autonomes Sammeltaxi/ Ride Sharing



- **Fahrzeugnutzung:** geteilter Raum
- **Antriebsarten:** Benzin/Diesel/Elektro?
- **Geschwindigkeit:** wie Pkw
- **Platzangebot:** 5–9

Autonomes Privatauto

- **Fahrzeugnutzung:** privater Raum
- **Antriebsarten:** wie Pkw
- **Geschwindigkeit:** wie Pkw
- **Platzangebot:** 5

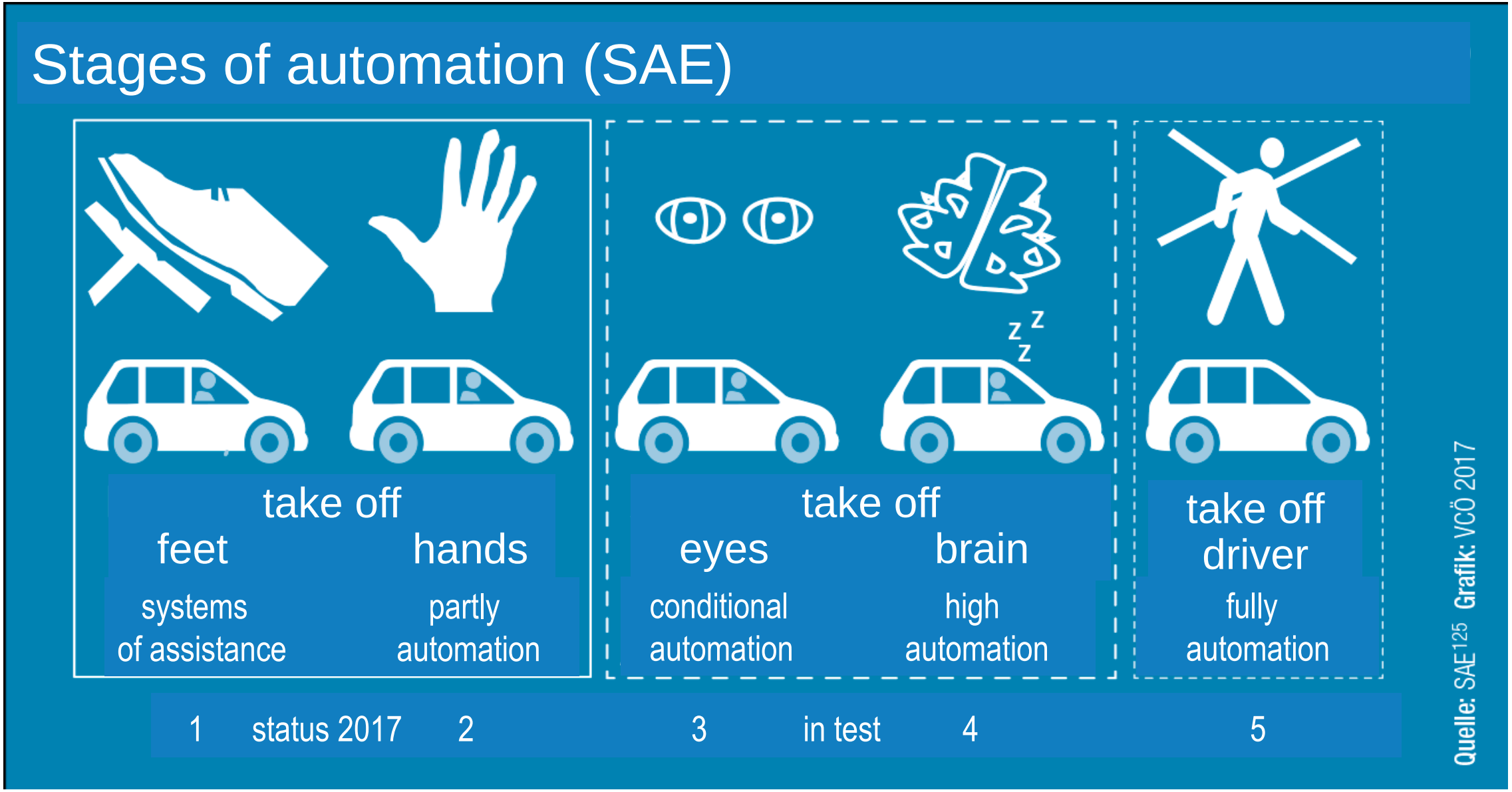
Voll-automatisierte Güterbeförderung

- **Fahrzeugnutzung:** Güterbeförderung
- **Antriebsarten:** Diesel/Elektro
- **Geschwindigkeit:** max. 85 km/h
- **Nutzlast pro Einheit:** Bis zu 44t

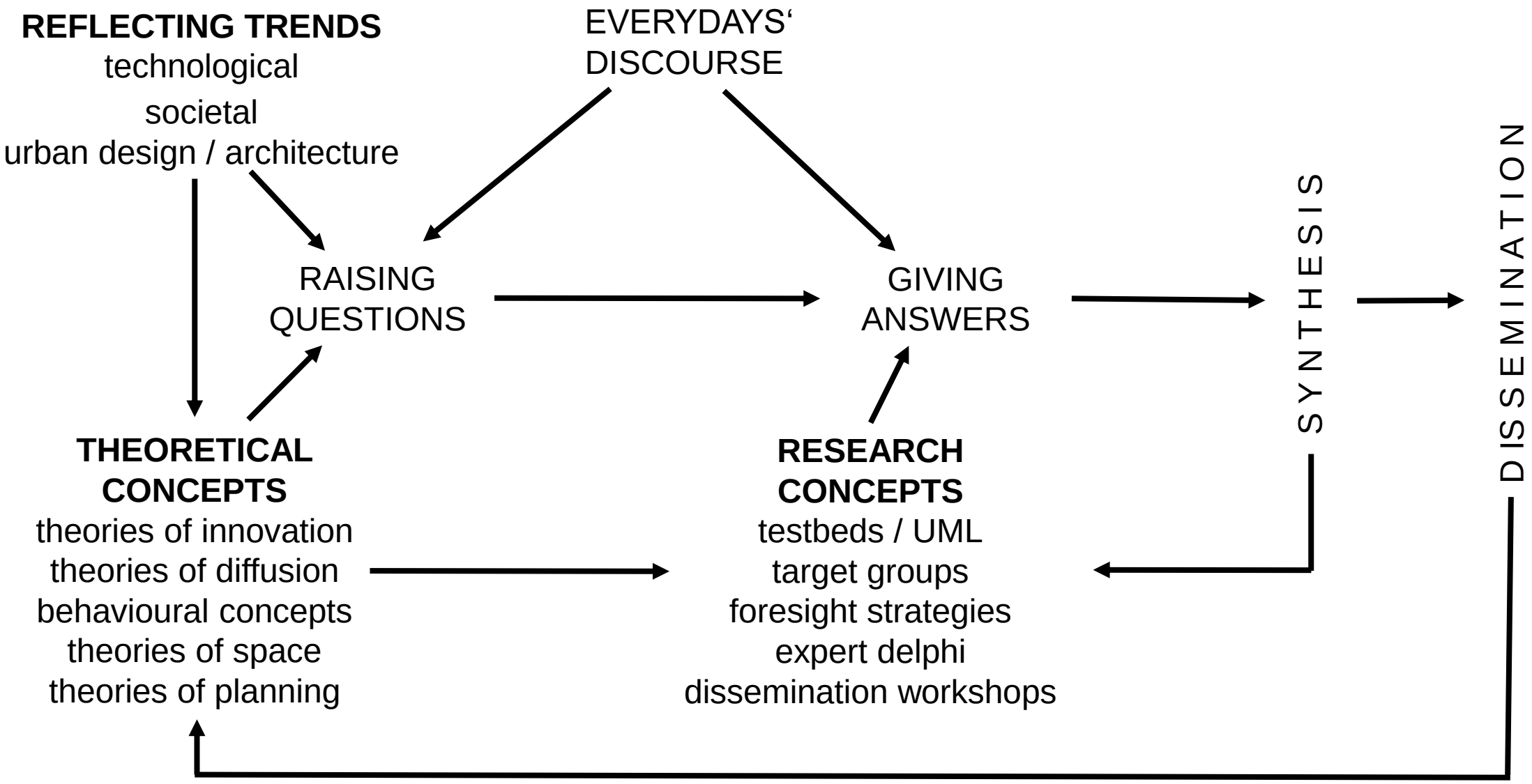
Voll-automatisierte Güterbeförderung

- **Fahrzeugnutzung:** Güterbeförderung
- **Antriebsarten:** Elektro
- **Geschwindigkeit:** max. 6 km/h
- **Nutzlast pro Einheit:** 18 kg

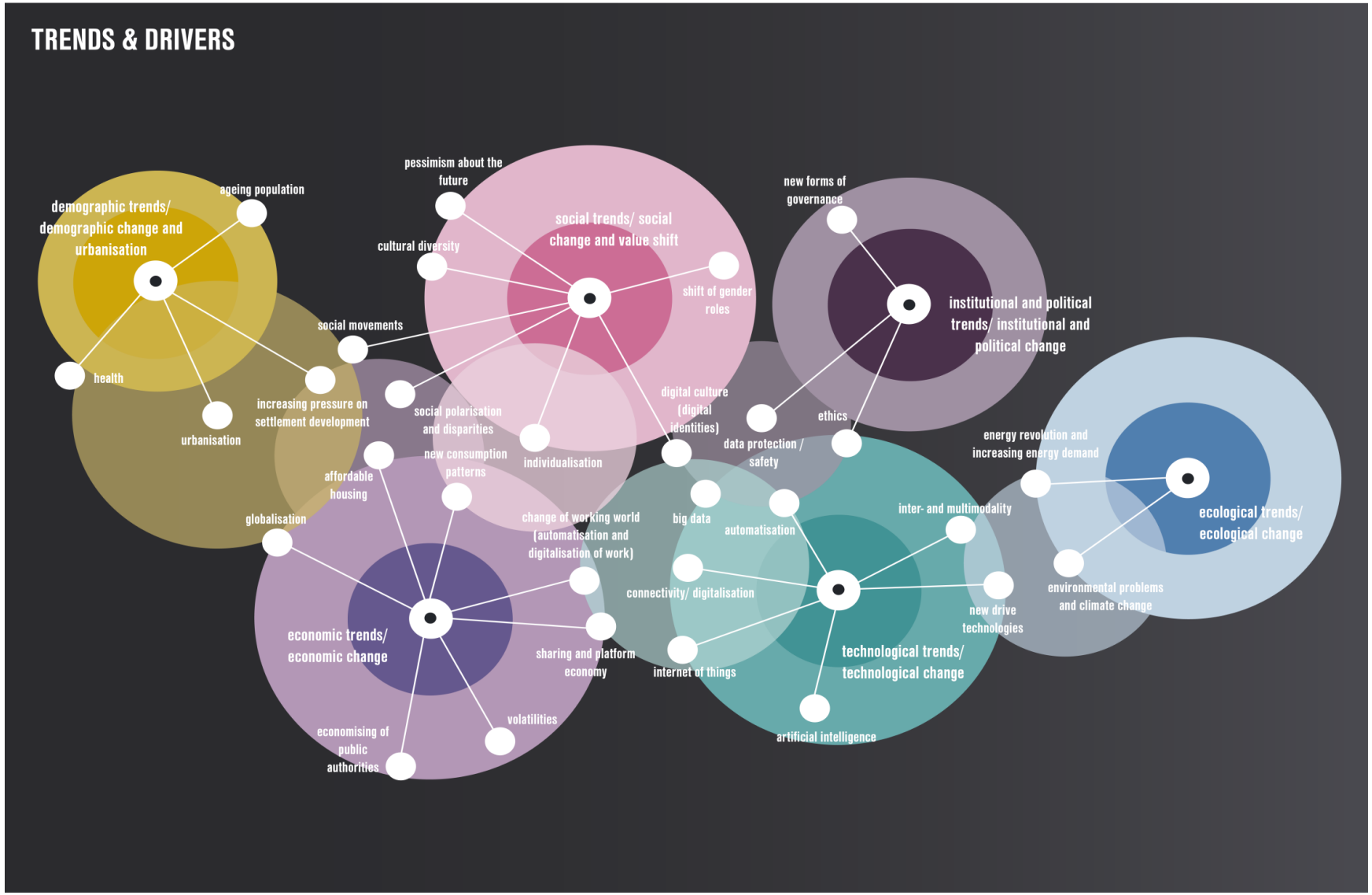
Automated vehicles – what are we talking about?



AVENUE 21 research design



Trends and drivers of AV



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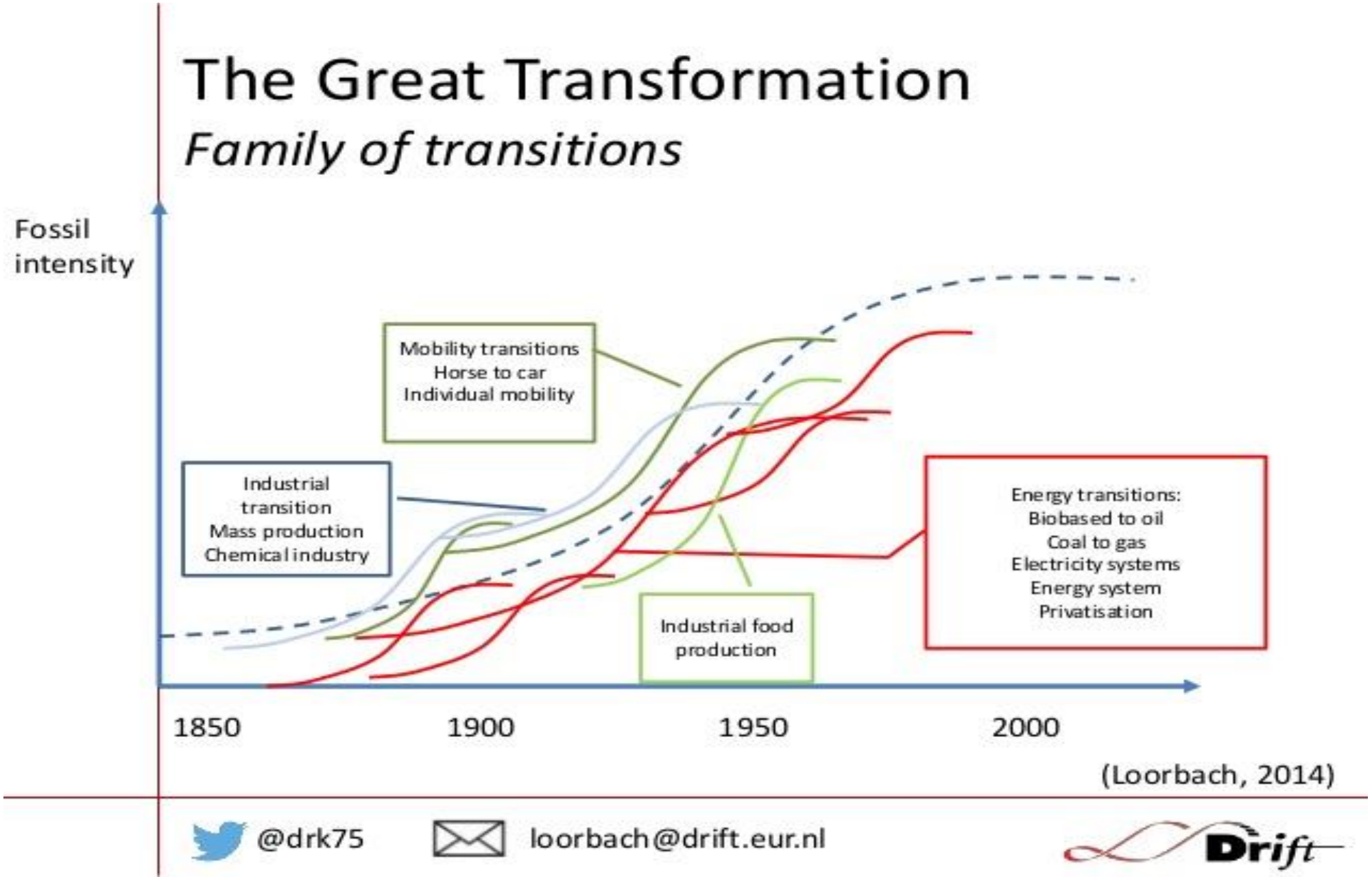
Automated driving is embedded in other technological and societal transformations

- ICT – Internet, Web 2.0 (communication, political organisations)
- 5-G networks
- life-sciences (DNA-technologies)
- artificial intelligence
- Internet of Things (IoT, connectivity)
- 3-D-printing (maker scene, DiY, co-creation)
- energy saving technologies (climate change)
- sharing economy platforms

Image of late 1950s, USA

➔ what does it mean for (sub-)urban transition?

Transformations



Technological background

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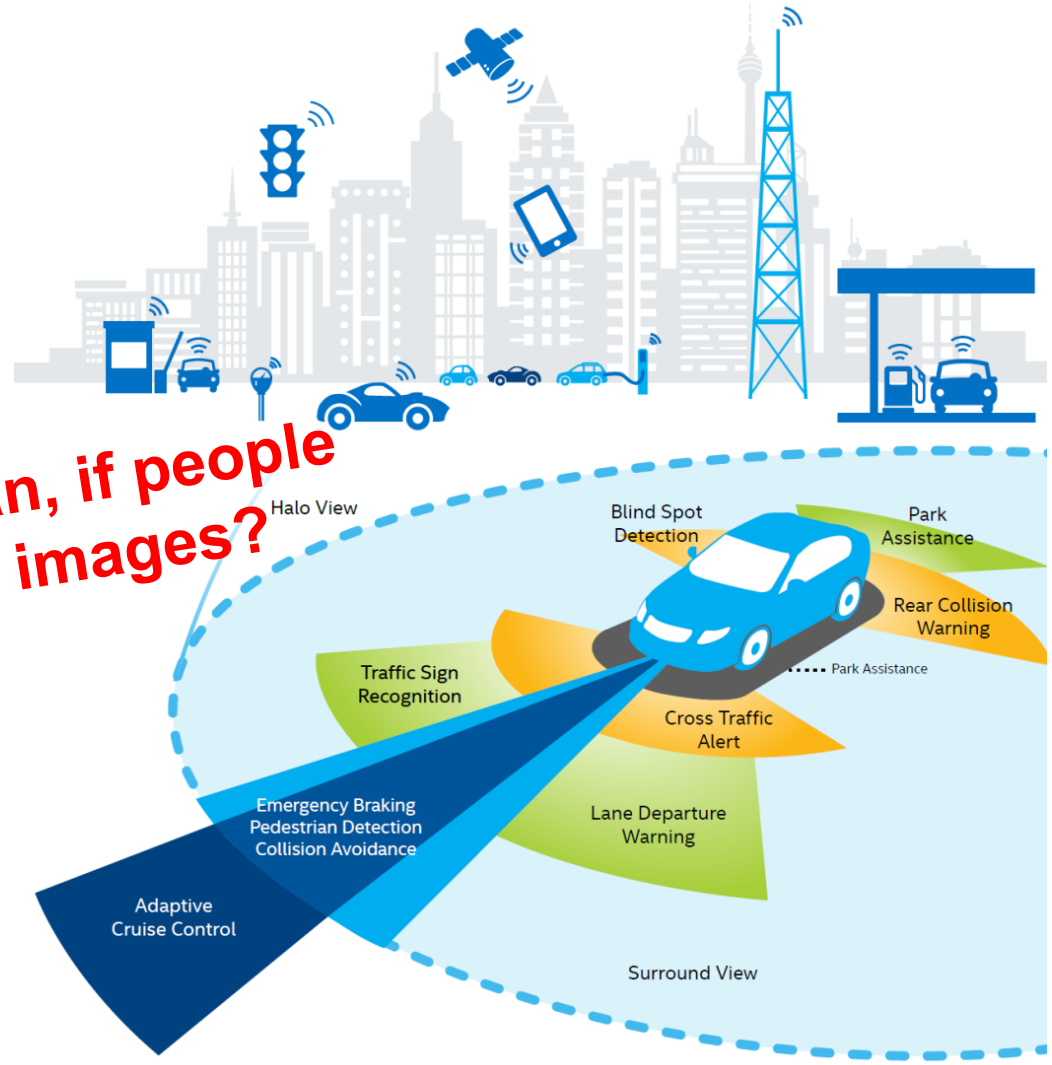
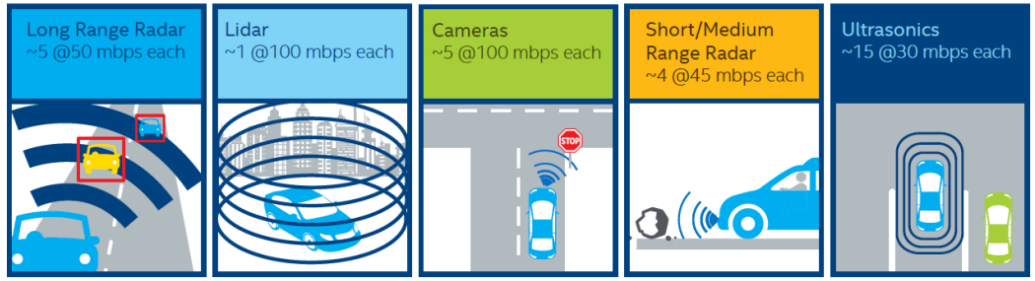
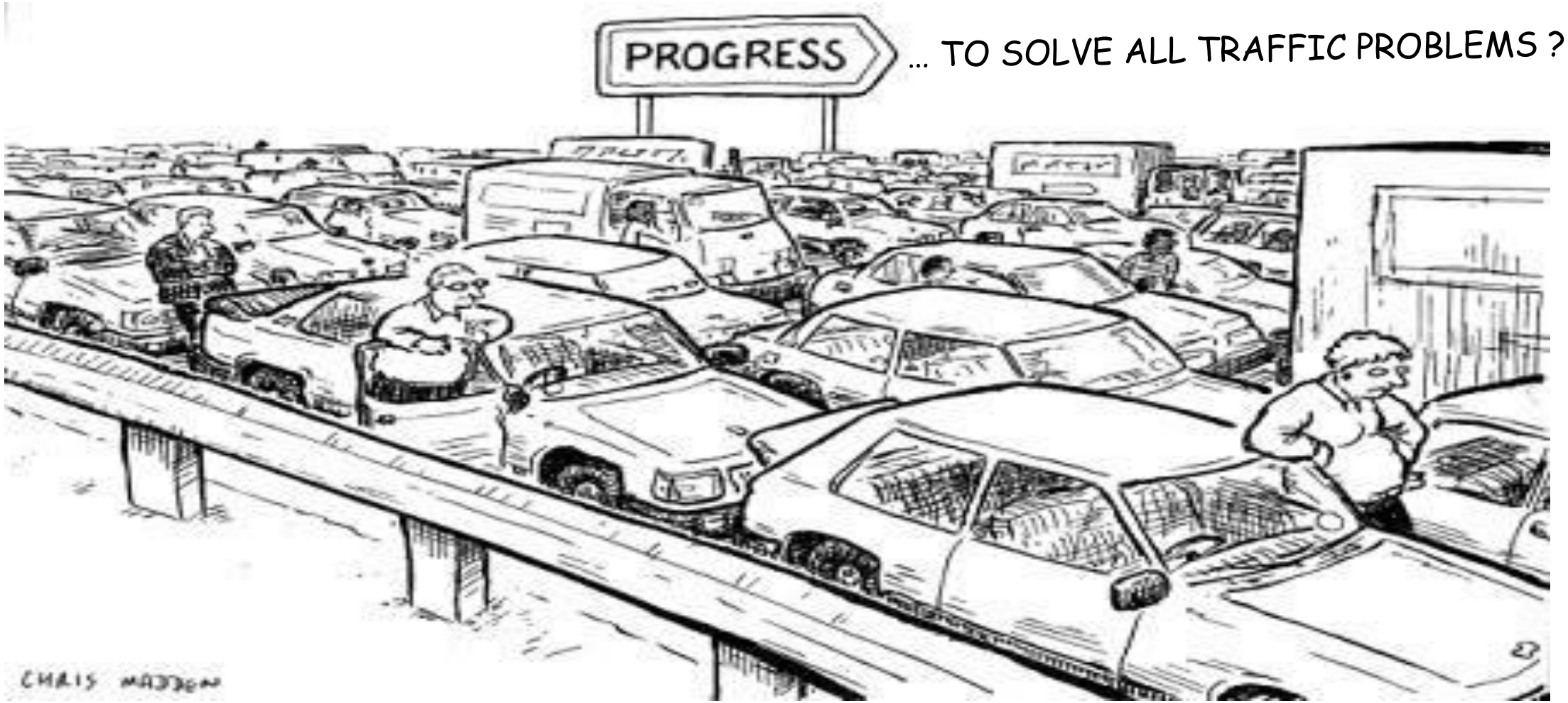
What does it mean, if people are absent in the images?



Cars will sense and connect with many things for 360° awareness.



Positive implications of technological change: The bright story of AV



The bright story of AV

- AV will make traffic safer (almost no accidents, cost savings, etc.)
- AV can be organized …
  - by efficient speed control (CACC = Cooperative Adaptive Cruise Control)
    - almost no congestion
    - decrease in energy consumption
    - decrease of emission of greenhouse gases
  - to retrieve of public space (in cities) and
  - enable (re-)integration of mobility-impaired social groups
- AV needs innovative technologies; thus, there is a push for competitive development of technologies (economic competitiveness)
- Individual benefits for drivers (obtaining time of travelling and car parking; comfort of seamless travelling)

Under which conditions this will be realistic?

➔ AV makes car safer, drivers more aware, accidents less likely and lowers emissions

Negative implications of technological change: The dark story of AV

Help!

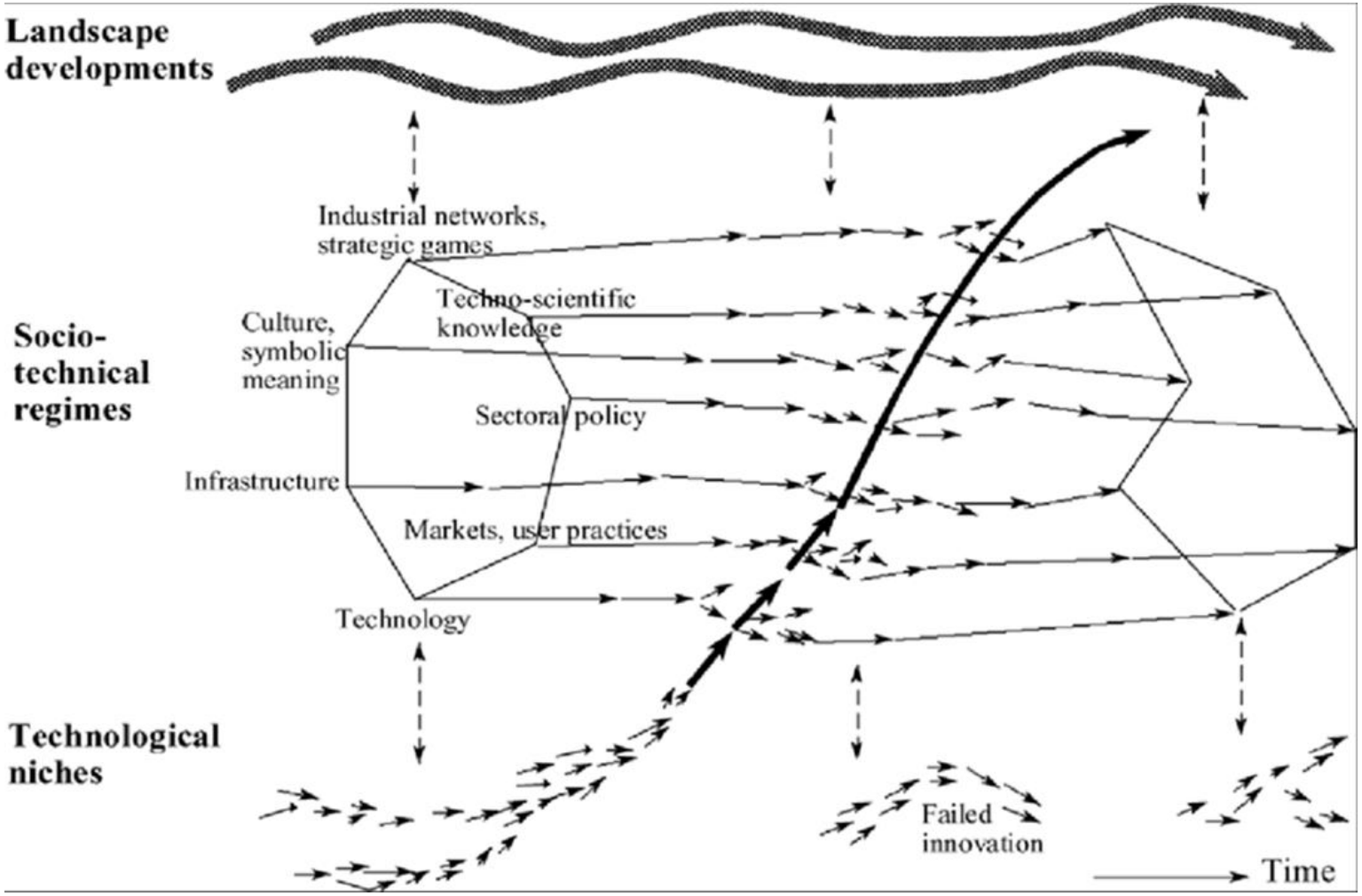
The dark story of AV

- The positive assumptions are by far too optimistic and dependent from side-effects
- The interest of those pushing AV is not improving mobility, but the harvesting of on-trip data (by Alphabet et al.) and/or to open awareness for positive aspects of digitalisation and/or to be one of the first test-beds (national states, regions, cities etc.)
- If comfort is the main driver of demand traffic will improve and produce rebound effects
- AV will be socially and spatially selective (due to prime costs and benefitting from time saving)
- AV will raise the interest of allocation in suburbia (private households and working places in service sector) and thus will increase travel distances and daily vehicle use
- AV will out-compete public transport modes ➔ both aspects will undermine the aims of sustainable spatial planning
- Broad scepticism against AV among citizens (ca. 60%), because of
  - broad mistrust against the reliability of the technological systems
  - mistrust against the potential hacking of cars
  - mistrust against 'big data' (Who owns the data?)
  - unwillingness to become an assistant driver

Who is caring for the risks?

Autonomous vehicles are part (or driver?) of a much larger world of disruptive digital transformation

Technical development from the point of socio-technical regimes



Geels, Frank W. (2011): The multi-level perspective on sustainability transitions: Responses to seven criticisms. In Environmental Innovation and Societal Transitions 1 (2001): 24-40.

Essential Challenges

Against the background of the ‚Grand Challenges‘ AV implies a couple of essential challenges in those political and research fields, which are strongly determined by its technological feasibility.

1. The calculation, whether an ‘intelligent’ traffic control can reduce the number and severity of accidents, strongly depends from market penetration (the longer mixed situations exist, the more risky traffic will be).
2. The degree of the reduction of energy consumption and emissions of greenhouse gases by an ‘intelligent’ traffic control depends more from other factors like post-fossil engines and the change of mobility styles (like sharing, active forms of mobility) than from AV.
3. The development of Avs can be done in an *evolutionary manner* (further developments of driving assistance systems of the car industry) or in *revolutionary manner* (availability from the scratch by career changer from the IT branches) – to plan and steer the development is one of the main tasks for policy maker and/or planners.
4. Who is paying for the new infrastructures which guarantees the V2V, V2I and V2X communication? Who owns the data?

Essential Challenges ctd.

5. Even though most publication (predominantly from engineers' sides) act on the assumption that traffic will decrease and public space can be reclaimed, there are other voices arguing for the opposite that traffic will grow due to comfort (‚seamless transport') and longer distances; for these voices more attention must be paid (cf. following points 6, 7).

6. If AV really generates benefits of comfort and time saving (no active car parking), than AV is a strong competitor for public transport both within the agglomerations but as well between cities. Providers of public transport, therefore, need to react with new types of flexible and small vehicles, new business plans and new forms of cooperation.

7. For those people who really save time (for other important activities) suburban places are becoming more attractive, which will support the sprawling of the suburban zones.

8. Point 6, 7 clearly contradict the aims of sustainable settlement development – again it is an open question whether an how regional/local politicians and spatial planners will handle it.

Essential Challenges ctd.

9. In most of the European countries scepticism against AV is high due to different reasons. How to handle the situation if citizens' interests are against technology policies?

10. Logistics were not mentioned so far. Learning from the past, logistic formed the organisation of the European cities, which resulted not only in lock-in effects of infrastructures but as well illogical mobility behaviour (car dependency and car use).

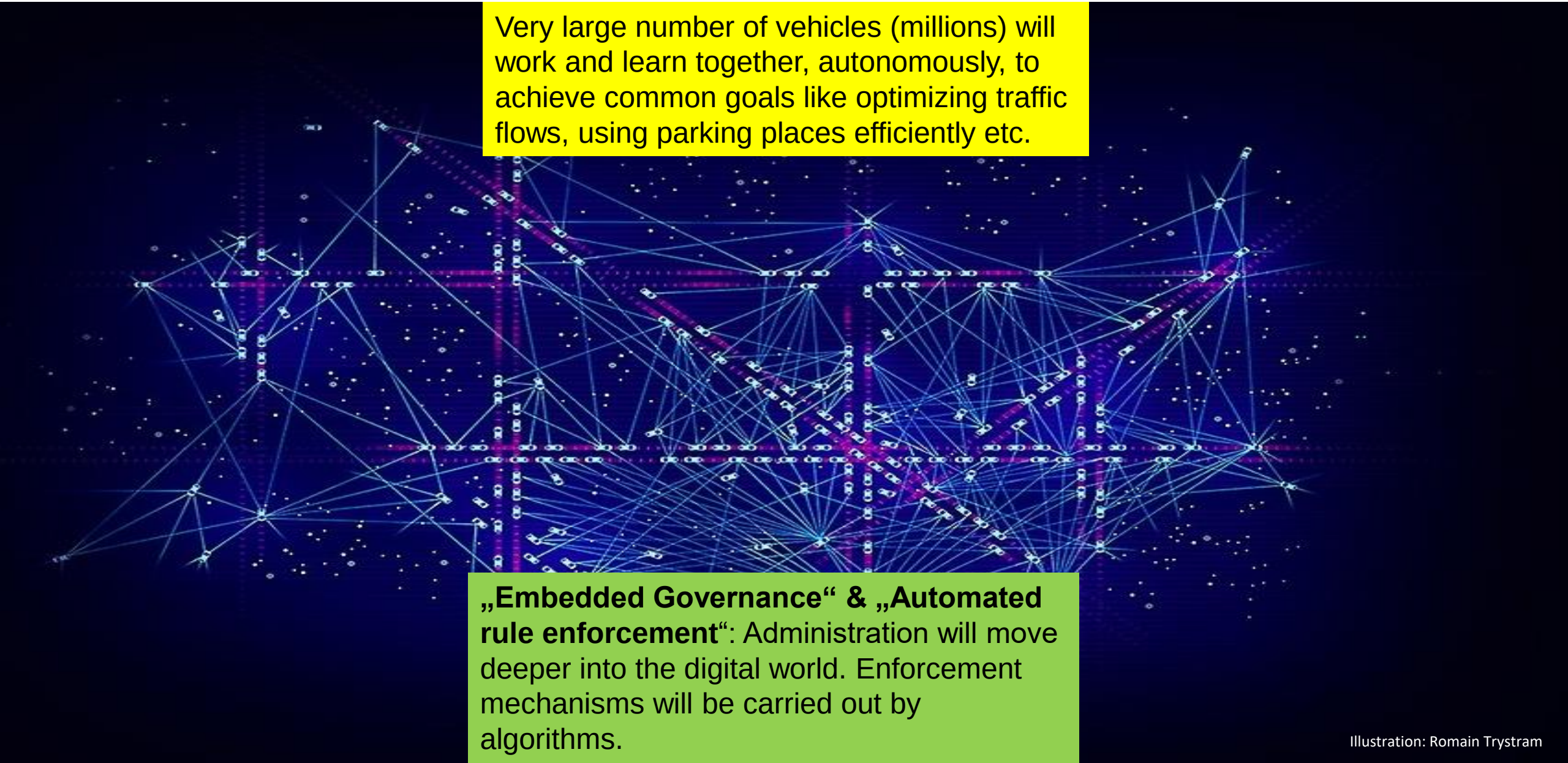
    In those branches where professional drivers are working, the pressure of AV is high (for platooning, robo-caps, autonomous busses, drones and other innovative vehic-les). This will change inner-regional and inner-urban delivery systems dramatically (first and last mile). This development follows a specific inner logic and needs a strong regulation by public administration (tax and toll systems or exclusive rights to serve specific districts).

    This will result one the one hand in totally new infrastructure (multi-modality hubs, freight hubs), but as well in old-fashioned (automative) car-friendly solutions with its lock-in effects.

A curious challenge: New social contract?

Paradigmatic shift to authority from humans to machines & algorithms

Very large number of vehicles (millions) will work and learn together, autonomously, to achieve common goals like optimizing traffic flows, using parking places efficiently etc.



„Embedded Governance“ & „Automated rule enforcement“: Administration will move deeper into the digital world. Enforcement mechanisms will be carried out by algorithms.

Illustration: Romain Trystram

Core Question

What do we want …

"AV-Ready" Cities or "City-Ready AVs?”

(Rupprecht et al. 2018)

But why we do not follow this way?

Thank you for your interest

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