MORE Webinar Session 2
Visions of Future Streets - Insights from MORE

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Advanced Technologies for Sustainable Mobility
Trends and Challenges

Dr. Meng Lu, PEEK, The Netherlands

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Technological observations

- ~ 2500 Y roads
  physical and digital infrastructure
- ~ 130 Y cars
  >30% value imbedded electronics
- ~ 35 Y personal computer
  towards a communication device
- ~ 25 Y cellular phone
  towards a multi-function device

- ~ 30 Y internet
  Internet concept 1960s; World Wide Web invented in 1989
- ~ 40 Y AI
  AI research since 1950s; commercial success of expert systems in 1980s

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Advanced technologies

- ICT, sensors technologies, positioning, control technologies, materials science and construction, modelling and data analytics
- IoT, connectivity, big data
- Quantum computing
- Automated road transport
- Three-dimension multi-modal transport infrastructure
- … but there are also a lot of hypes and illusions

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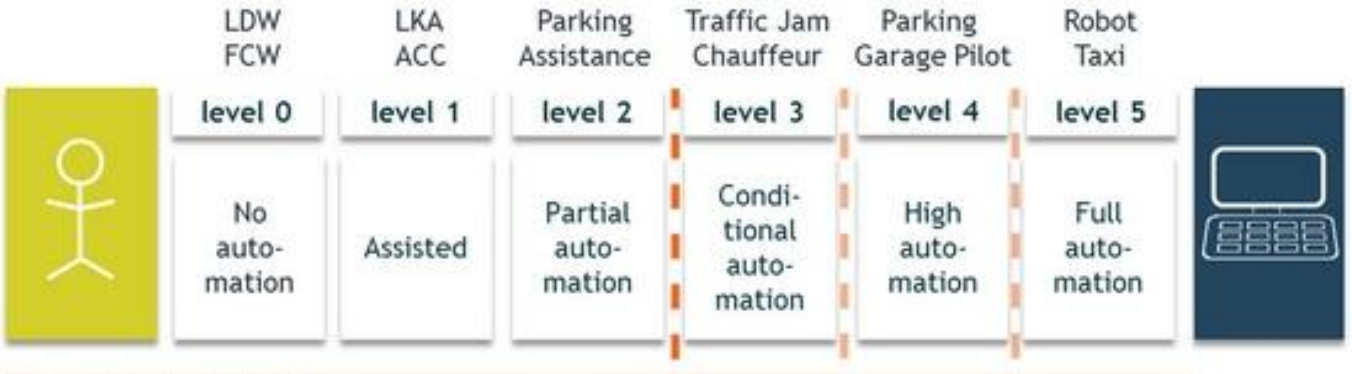
Automated driving

Source: Adaptive

Levels of driving automation (SAE/VDA)



Source: SAE document J3016, "Taxonomy and Definitions for Terms Related to On-Road Automated Motor Vehicles", issued 2014-01-16, see also http://standards.sae.org/j3016_201401/

Source: Adaptive

Advanced technologies and applications

- Infrastructure
  - data exchange and V2X communication, traffic management (all modes)
- Public transport
  - data exchange and communication, e.g. e-ticketing, multi-model / VRU services
- Private vehicles
  - sensor and communication, e.g. ADAS
- Commercial vehicles
  - tracing and tracking, e.g. fleet, freight and hazard goods management

~ 40 years ITS development and deployment for road safety, traffic efficiency, energy efficiency, environment and comfort

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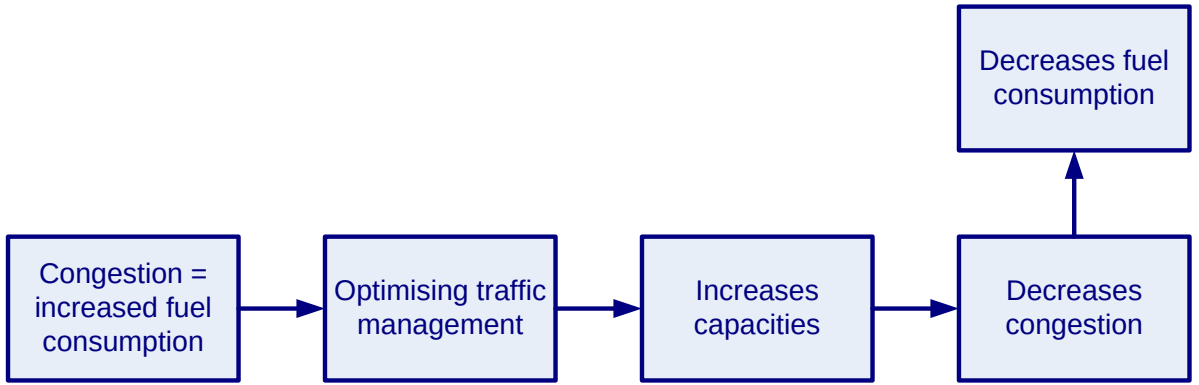
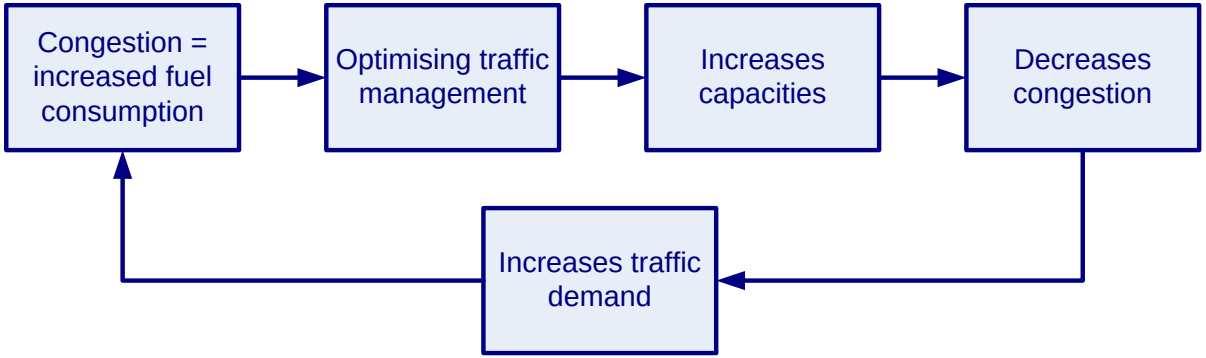
Traffic management: short term effects



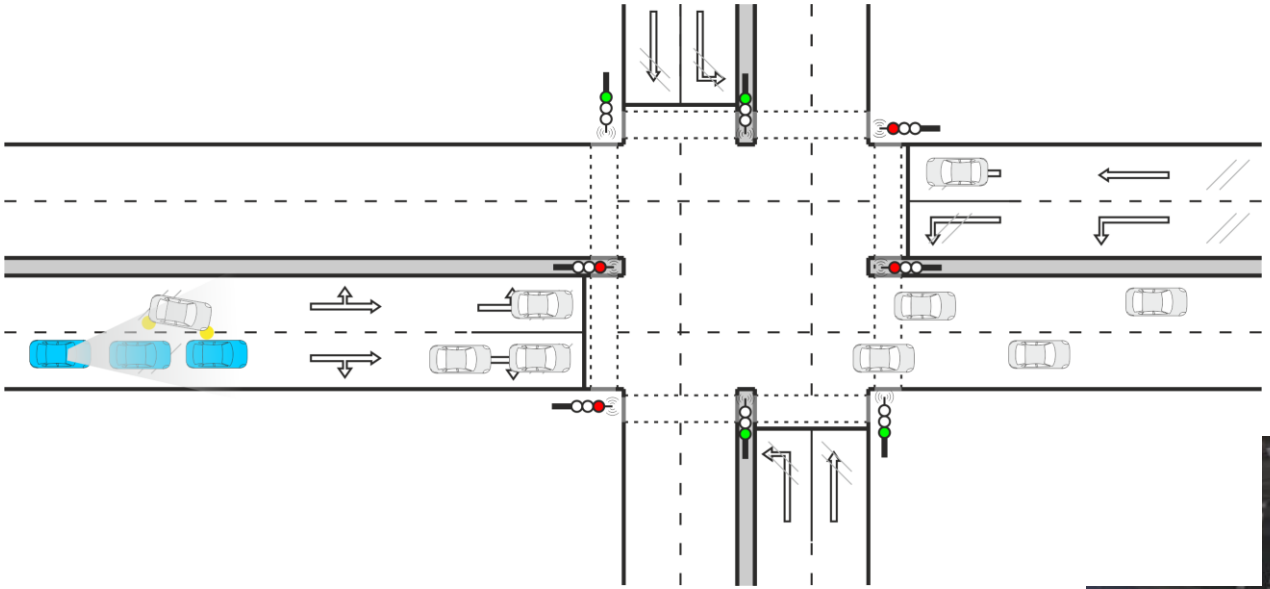
Traffic management: long term effects

- Is traffic management a nonsense for sustainable development?



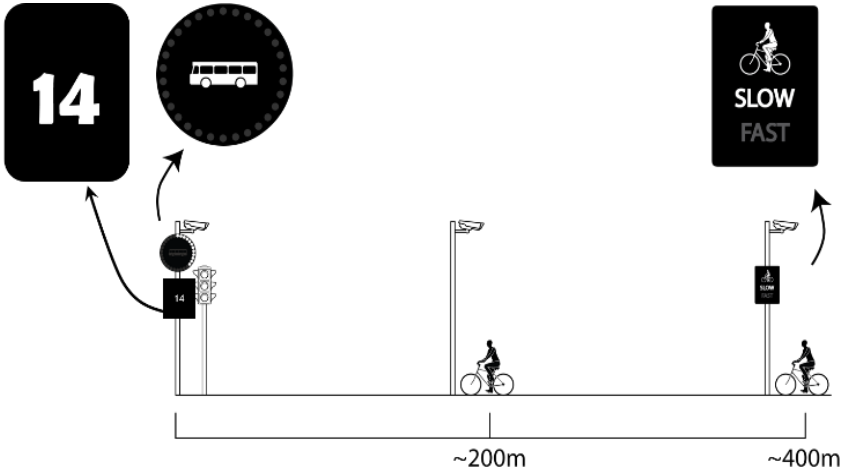
TM must be associated to demand mgmt and supply (capacity) mgmt; approaches for avoiding unnecessary congestion different in different situations: fluid, recurrent congestions, incidents-caused congestions.

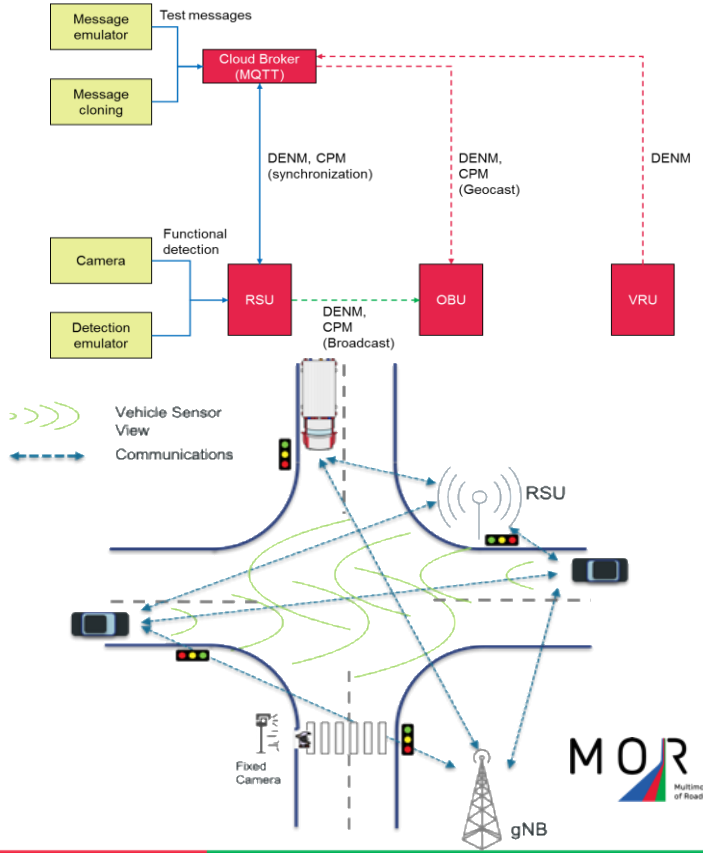
ADAS techniques to prevent and/or mitigate dangerous situations



Source: MAVEN

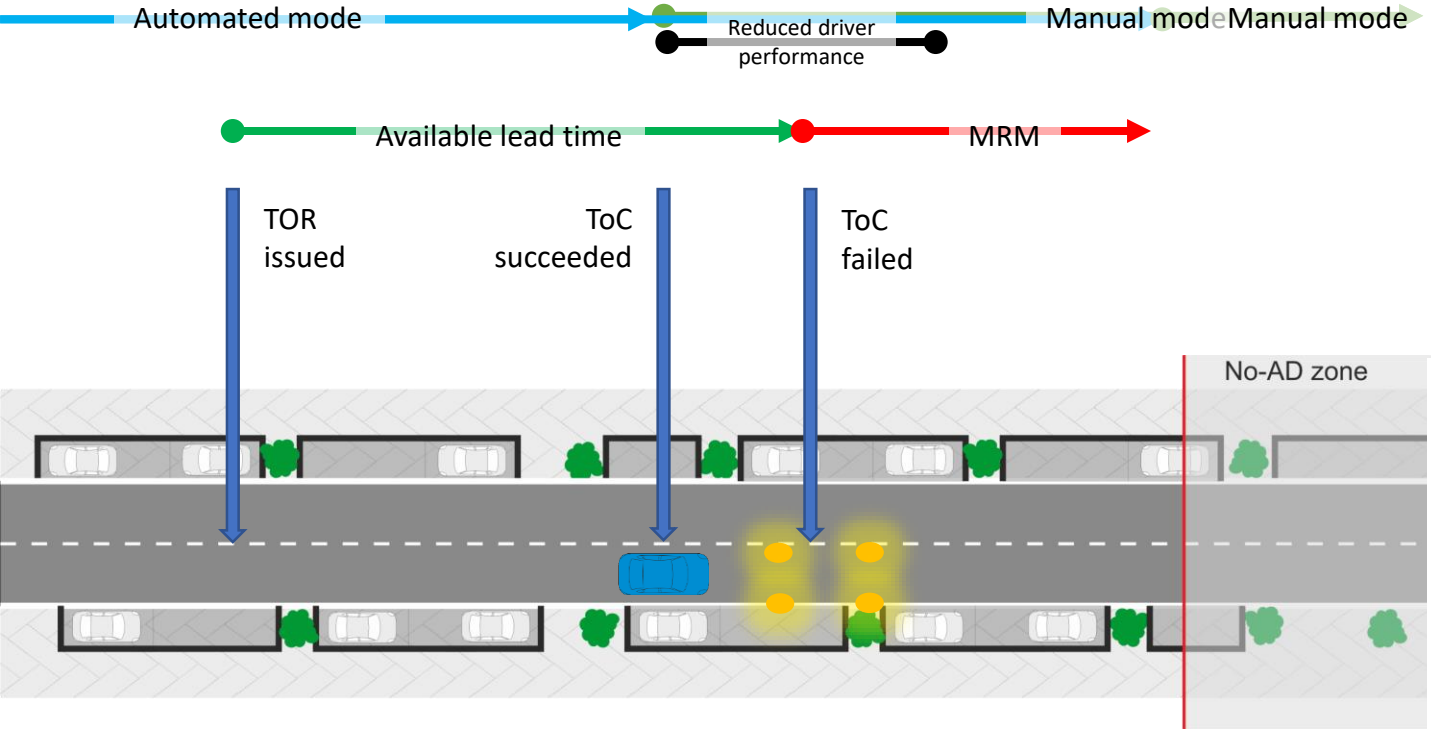
ICT infrastructure for vehicles, cyclists and pedestrians





Source: XCycle, 5G-DRIVE, 5G-HEART

Operational Design Domain (ODD)



- ToC: Transition of Control
- TOR Take Over Request
- MRM Minimum Risk Manoeuvre

Source: TransAID

C-ITS services for road space management

- Urban Parking Availability
  - information about a parking space
  - reservation of a parking space
- Road Hazard Warning
  - hazardous location notification
  - traffic condition warning
  - weather condition warning
- Emergency Vehicle Warning
- Warning System for VRUs
- Green Priority
- Green Light Optimal Speed Advisory
- Cooperative Traffic Light for Designated VRUs
- Flexible Infrastructure (peak-hour lane)
- In-Vehicle Signage
- Mode & Trip Time Advice

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C-ITS benefits

- Fatalities reduction
  - road works warning 9%
  - road hazard warning 9%
  - in-vehicle signage 6%
- Injuries reduction
  - signal violation warning 7%
  - in-vehicle signage 6%
  - motorcycle approaching indication 4%
- Travel time reduction
  - green priority 9%
- Average speed increase
  - mode and trip time advice 8%
- Fuel consumption reduction
  - green priority 17%
  - mode and trip time advice 6%
- CO_2 reduction
  - mode & trip time advice 6%
  - green priority: 5%

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Solutions and challenges

- Not targeting right issue and right solution (lack of holistic view)
  - climate change – not only CO_2 (pollution / damages) – not only clean vehicles (hydrogen / EV) – electrification ≠ green / clean (energy source, supply chain)
- Pros and cons of each solution (lack of planning or knowledge)
  - solve one problem or bottleneck – vehicle-oriented road design
  - create other problem(s) – road space for VRUs
- Challenges in a connected world, e.g.
  - (cyber) security – quantum computing?
  - data privacy – anonym?
  - data analytics – AI/ML?
  - logistics – 3D printing? …

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Holistic view

- Policy, regulation, awareness and incentives
- Advanced ICT and physical/digital infrastructure
  - proliferation of consumer electronic devices
  - ubiquity of commercially-available wireless coverage
  - emergence of new communication and sensing technologies
  - vehicle technologies and connectivity
- Connecting hubs and modes
  - C-ITS, future TM (all modes), data, information, telematics services, (un)load unit, transshipment, supply chain management, resilient systems

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Conclusion

- Advanced technologies may impact cities
  - IoT, ICT, automated vehicles, drones (emergency services, police, healthcare) …
- Role of the municipalities
  - physical and digital infrastructure, vehicles and VRUs, interactions of the components
- Mobility as a Services
  - services/information for people, services for goods, technologies in progress enabling new business (for safety, efficiency, air quality, environment, economy)
- Future mobility
  - ICT-assisted road space design and use; special services based on cooperative and automated driving, dynamic traffic management

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Dr. Meng Lu
meng dot lu at dynniq dot com

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