Ministry of Infrastructure and the Environment

Autonomous driving; the context for mid- and long-term research questions

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Societal impact of the system at ‘full automation’

- # cars and car ownership
- cars needed for peak demand
- congestion levels
- VMT
- Spatial development
- parking space
- traffic safety
- impact on environment

cars and car-ownership – an example

- ITF simulationstudy for ‘imaginary’ city (ITF, 2014)
- 2 autonomous driving concepts: TaxiBot en AutoVot (no low cap PT)
- Vehicles are shared
- Possible impact: 9 out of every 10 cars is not needed

Scenario – 24 hours	Fleet size
Baseline (% of baseline fleet)	203,000
TaxiBot Ride-sharing: No high capacity public transport (commuter rail, subway, BRT, LRT)	25,917 **12.8%**
TaxiBot Ride-sharing: High capacity transport (commuter rail, subway, BRT, LRT)	21,120 **10.4%**
AutoVot Car-sharing: No high capacity public transport (commuter rail, subway, BRT, LRT)	46,249 **22.8%**
AutoVot Car-sharing: High capacity transport (commuter rail, subway, BRT, LRT)	34,082 **16.8%**

Cars needed for peak demand – an example

- Smaller impact on # vehicles needed for peak demand (range 23% - 65% less vehicles)
- Possibly a big effect on congestion levels

	Scenario – Peak hours only	Fleet size
	Baseline (% of baseline fleet)	60 000
TaxiBot Ride-sharing	No high capacity public transport (commuter rail, subway, BRT, LRT)	25 867 **43.1%**
	High capacity transport (commuter rail, subway, BRT, LRT)	21 105 **35.2%**
AutoVot Car-sharing	No high capacity public transport (commuter rail, subway, BRT, LRT)	46 011 **76.7%**
	High capacity transport (commuter rail, subway, BRT, LRT)	33 975 **56.6%**

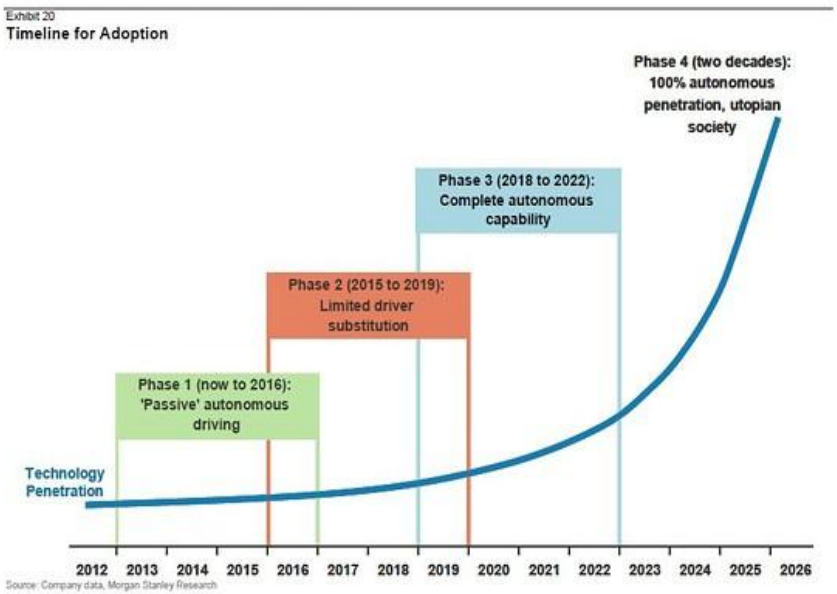
VMT

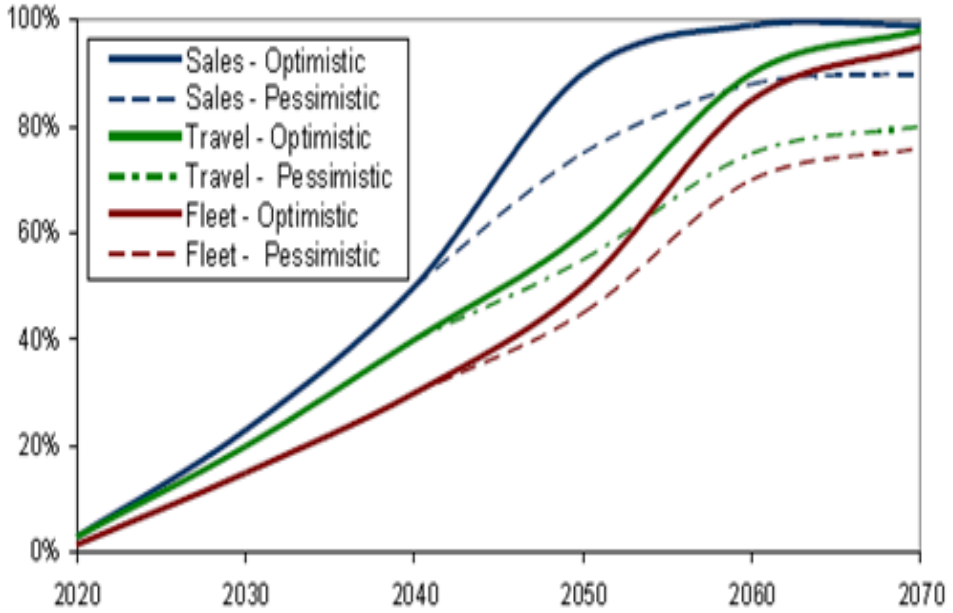
- Increase as a result of decreasing bus travel and repositioning (range +6% to +89%) – *no 'new' users*

	Scenario – 24 hours	Car-kms (million)
	Baseline (% of baseline car-kms)	3.8
TaxiBot Ride-sharing	No high capacity public transport (commuter rail, subway, BRT, LRT)	4.62 **122.4%**
	High capacity transport (commuter rail, subway, BRT, LRT)	4.01 **106.4%**
AutoVot Car-sharing	No high capacity public transport (commuter rail, subway, BRT, LRT)	7.15 **189.4%**
	High capacity transport (commuter rail, subway, BRT, LRT)	5.44 **144.3%**

Transition in perspective

- Two perspectives: technically possible / a 'new' transport system





- Transition: 'fluent' curve? Evolution, revolution or a number of well chosen 'leaps forward'?

Issues affecting transition and 'end state'

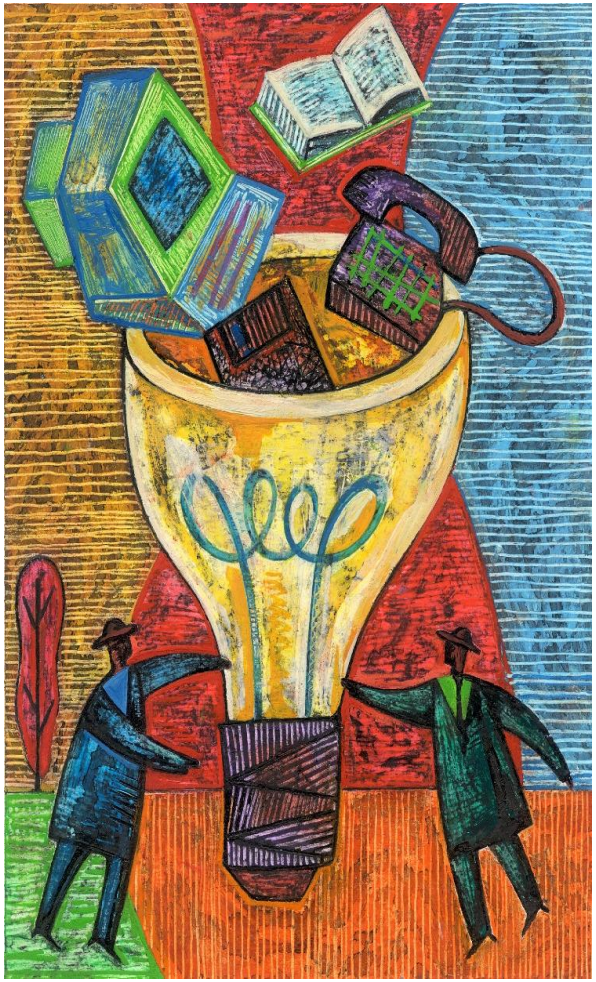
- Acceptance:
  - human-machine interaction (HMI)
  - From car ownership to car sharing
- Technology and infrastructure
- Cost
- Impacts (traffic, safety, enviroment) during the transition phase
- Opportunities for testing and certification
- Legal aspects
- Privacy aspects
- Ethical aspects
- Cyber security, use of data

Conclusions

- Future with high levels of ‘full automation’ is a valid option
- This will have huge consequences for the functioning of the system as a whole, with huge consequences in terms of societal benefits (and possibly costs)
- There are many knowledge gaps related to long term consequences and how they can / will develop:
  - Societal impact appears to be big (and possibly positive), but little knowledge is available
  - Many uncertainties in the transition towards full automation , including the ‘image’ of the end state.
  - Unclear what the impact of current policy interventions can be in the various transition phases and how such interventions can contribute to establish (positive) societal impacts

Research perspective

- High uncertainties combined with possibly high societal impacts trigger the need for research
- What we intend to do:
  - Reconnaissance of possible 'end states' and their potential societal impacts
  - Identification of the transition process towards these 'end states' in terms of:
    - What are potential societal impacts in these various phases?
    - What are crucial 'tilting points' between different phases?
    - What are crucial uncertainties in the various phase changes?
  - In order to identify the role policy can play regarding the various phases and phase changes?



Thank you