Exploring plausible futures of automated vehicles in the Netherlands: results from a scenario analysis

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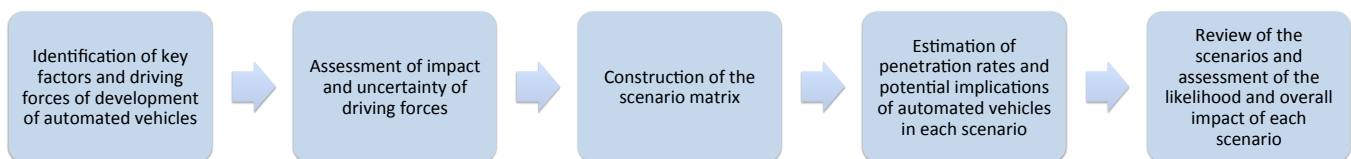[c] Transport and Logistics Group, Faculty of Technology, Policy and Management, Delft University of Technology

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Introduction

o The introduction to the market, the development and the implications of automated driving are among the main uncertainties of the future transport system.
o The design of robust long-term transport policies and investments needs to take into account those uncertainties.
o Our study aimed to identify plausible future development paths of automated vehicles (AV) in the Netherlands and to estimate potential implications for traffic, travel behavior and transport planning on a time horizon up to 2030 and 2050.
o We conducted a scenario analysis that involved experts from various planning, technology, and research organizations in the Netherlands and was completed in three workshops.

Methods

| Identification of key factors and driving forces of development of automated vehicles | → | Assessment of impact and uncertainty of driving forces | → | Construction of the scenario matrix | → | Estimation of penetration rates and potential implications of automated vehicles in each scenario | → | Review of the scenarios and assessment of the likelihood and overall impact of each scenario |

Results

Scenario Matrix

AV …in standby   **High technological development**   **AV …in bloom**

Restrictive AV policies ← → **Supportive AV policies**

AV …in doubt   **Low technological development**   **AV …in demand**

AV …in standby:
✓ Fully automated & cooperative vehicles (V2V) in 2030.
✓ Legislation inflexibility for AV. Transport policies restraining use of AV. High regulation of AV trials.
✓ Modest economic growth.
✓ "Wait and see…" customers' attitude, mid-low demand for AVs.
✓ No major environmental problems, but still low penetration of electric vehicles.

AV …in bloom:
✓ Fully automated & cooperative vehicles (V2V & V2I) in 2025.
✓ Laws allowing AV traffic. Limited regulation of AV trials. Public investments on AV research and on smart infrastructure.
✓ High economic growth.
✓ Positive customers' attitude, strong demand for AVs.
✓ Limited environmental problems. Clean technologies prevail.

AV …in doubt:
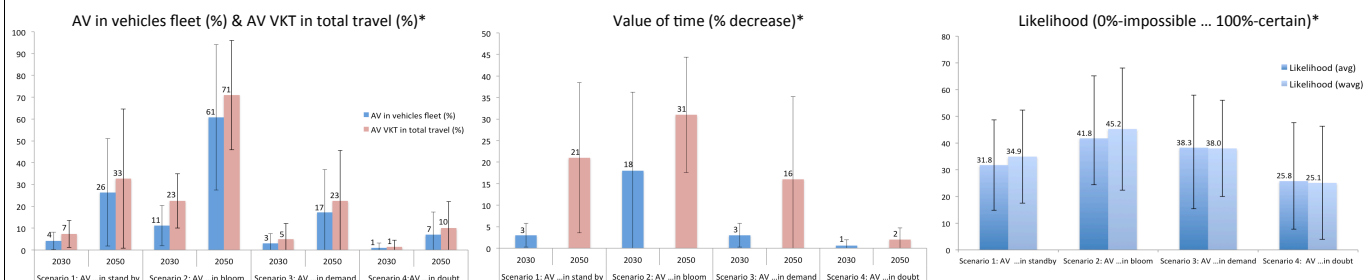✓ Fully automated vehicles in 2045.
✓ Limited legislation for AV integration. No AV trials allowed.
✓ Recessive economy, high unemployment.
✓ Negative customers' attitude, almost no demand for AVs.
✓ Important environmental problems. Very slow transition to low-carbon economy.

AV …in demand:
✓ Fully automated & cooperative (V2I) vehicles in 2040.
✓ Progressive legislation for AV integration. No regulation of AV trials. Promotional campaigns.
✓ Slow economic growth.
✓ "Not really interested…" customers' attitude, low demand for AVs.
✓ Increased environmental problems. Transport sector still among major polluters.

AV in vehicles fleet (%) & AV VKT in total travel (%)*

Value of time (% decrease)*

Likelihood (0%-impossible … 100%-certain)*

*Each bar represents the average value of five (twenty for the perception of likelihood) experts' responses collected in three workshops and the error bar depicts standard deviation.

Conclusions

o Fully automated vehicles are expected to be commercially available between 2025 and 2045, and penetrate the market rapidly after their introduction.
o Complexity of urban environment and unexpected incidents may influence development path of automated vehicles.
o Certain implications on mobility are expected in all scenarios, although there is great variation on the impacts among the scenarios.
o It is expected that measures to curb growth of travel and subsequent externalities will be necessary in three out of the four scenarios.

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PBL Netherlands Environmental Assessment Agency