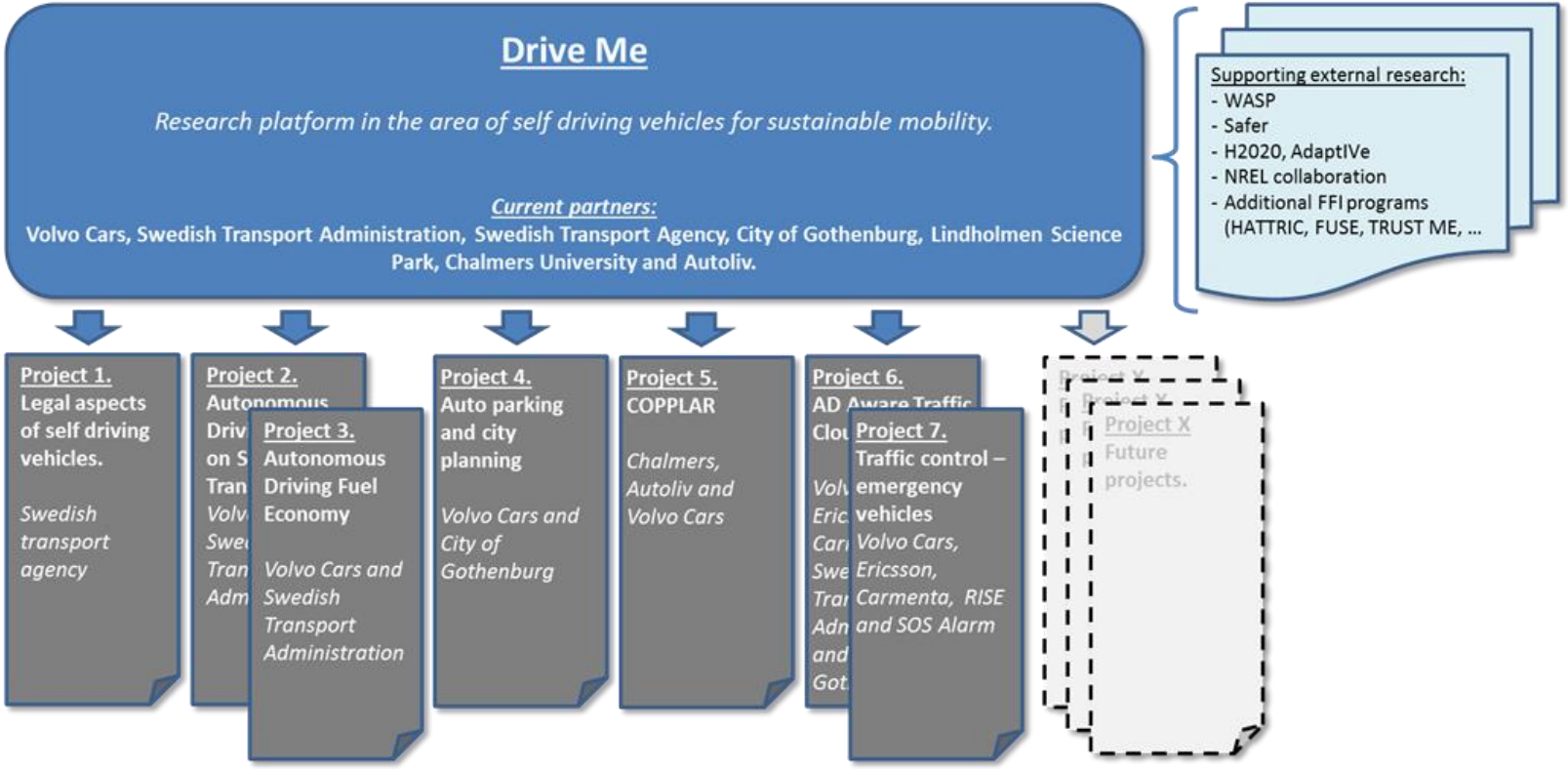
DRIVE ME RESEARCH PLATTFORM

Global challenges – Demand a joint effort

Drive Me - Nordic model of collaboration

Research platform – How autonomous cars can contribute to a sustainable development

DRIVE ME RESEARCH PLATTFORM



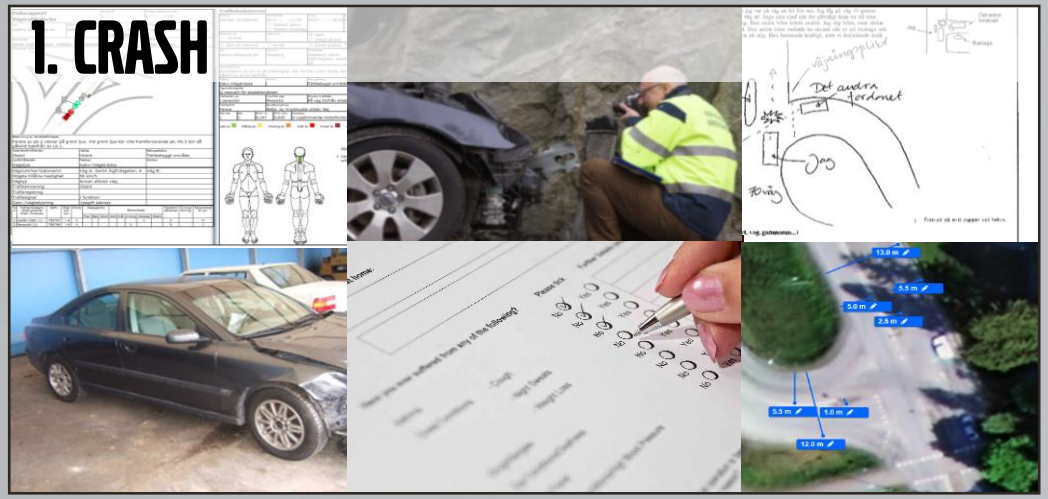
ADEST – SAFETY: SAFETY IMPACT ANALYSIS PROCESS

Version from 2015

ADEST – SAFETY: CAE VERIFICATION BASED ON CRASH DATA

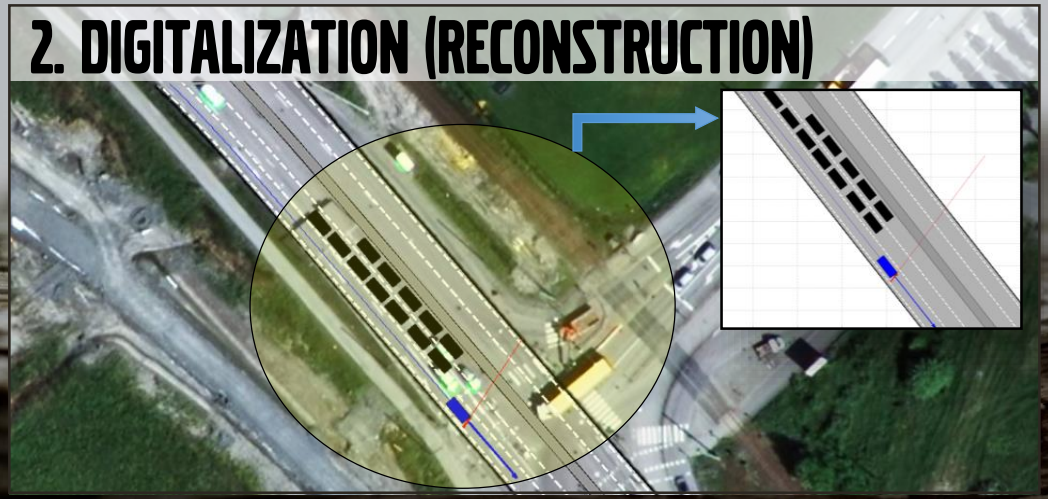
** Lindman, M., Isaksson-Hellman, I., & Strandroth, J. (2017). Basic numbers needed to understand the traffic safety effect of Automated Cars. In IRC-17-40 IRCOBI Conference 2017. (pp. 244–256). Retrieved from http://www.ircobi.org/wordpress/downloads/irc17/pdf-files/10.pdf*

1. CRASH

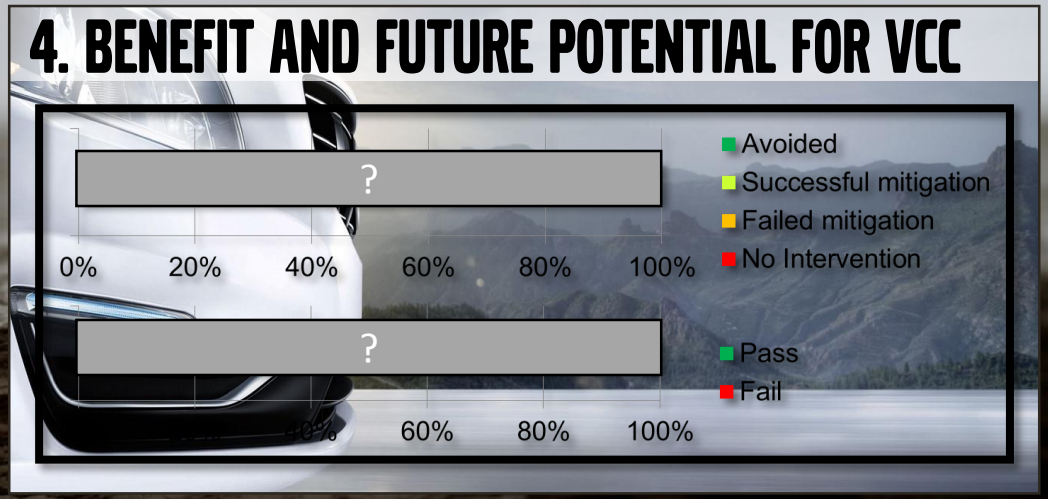


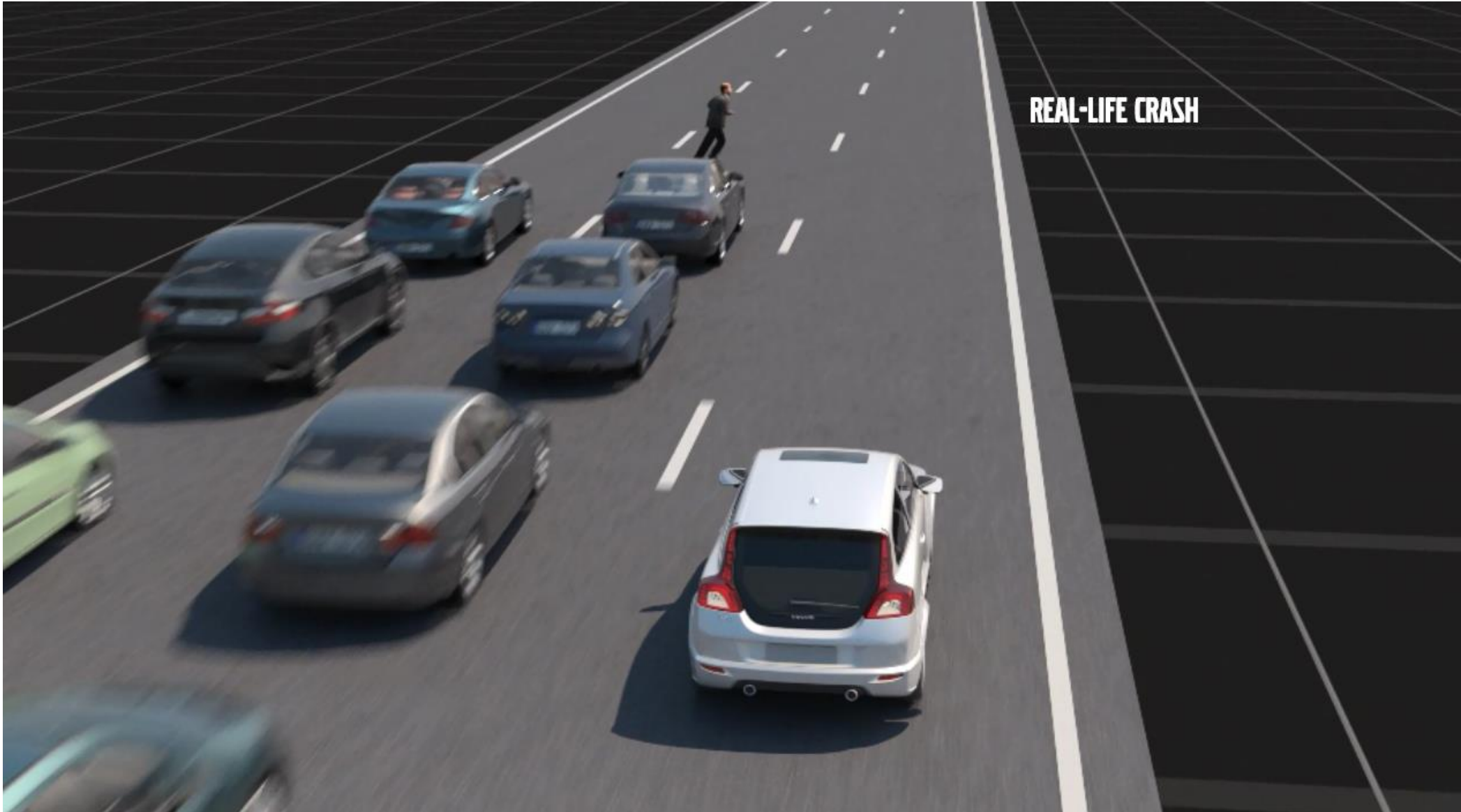
3. PRE-CRASH SIMULATIONS

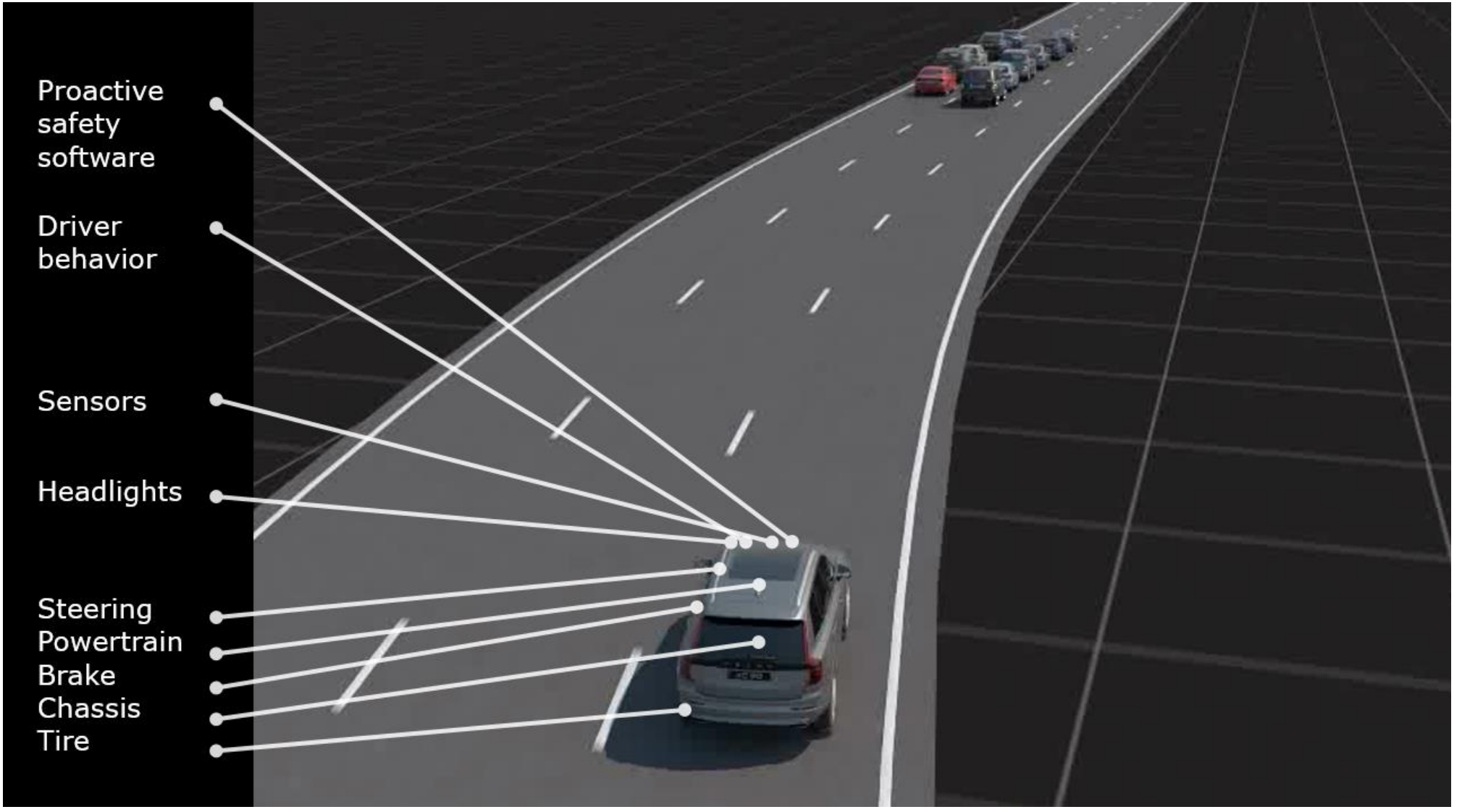
2. DIGITALIZATION (RECONSTRUCTION)

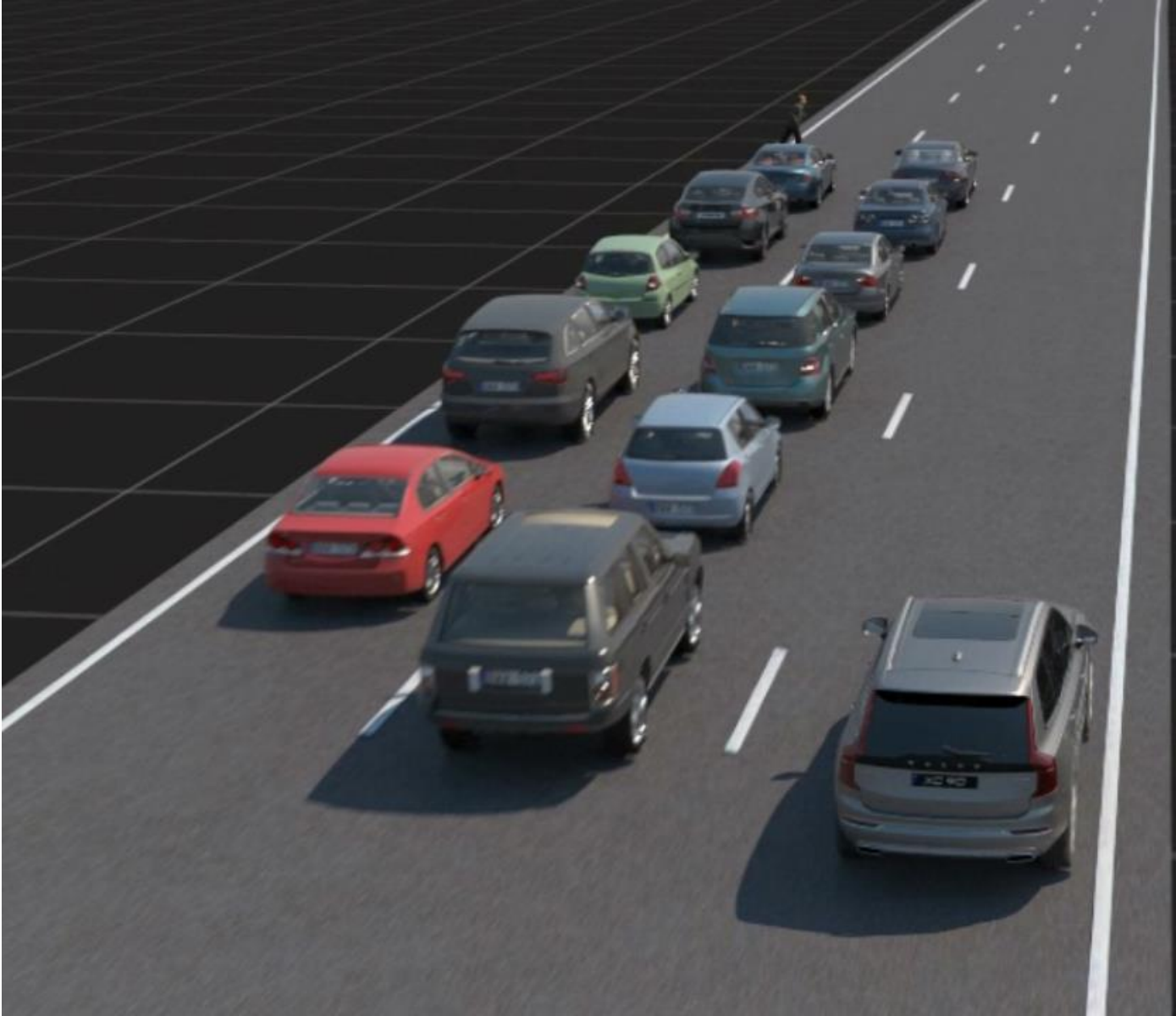


4. BENEFIT AND FUTURE POTENTIAL FOR VCC




REAL-LIFE CRASH


Proactive safety software
Driver behavior
Sensors
Headlights
Steering
Powertrain
Brake
Chassis
Tire



AUTONOMOUS DRIVE

BENEFITS IN THIS CASE:

- LOWER SPEED
- INCREASED LATERAL MARGIN
- 360° FIELD OF VIEW
- QUICK RESPONSE

ADEST – SAFETY: WOZ EXPERIMENTS ON ASTA TEST TRACK

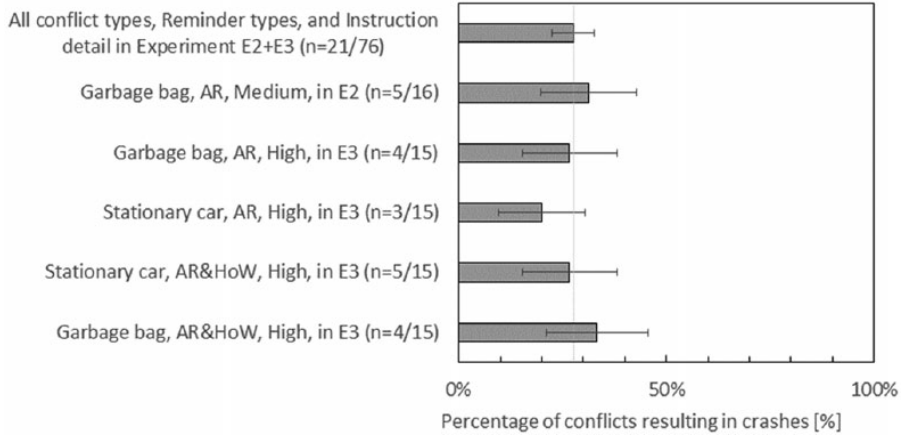
Method

- Supervised AD
- 30 minutes drive
- Conflict at the end of the drive

- Varying conditions:
  - Instruction detail on system limitations
    - Low, Medium, or High
  - Supervision reminders
    - Attention Reminder (AR)
    - Attention & Hands on wheel reminder (AR&HoW)

Results

- Supervision reminders work!
- .. But crash rates remains similar



Victor, W T., Tivesten, E., Gustavsson, P., Johansson, J., Sangberg, F., & Ljung Aust. M. (2018). Automation Expectation Mismatch: Incorrect Prediction Despite Eyes on Threat and Hands on Wheel. Human Factors. https://doi.org/10.1177/0018720818788164

ADEST – SAFETY: STATUS AND PLAN UNTIL END OF PROJECT

- Safety impact analysis process – to be updated based on lessons learned - Ongoing

- Crash data analysis & reconstruction - Completed
  - Data needs for retrospective safety assessment *”Basic numbers needed to understand the traffic safety effect of Automated Cars.”*
  - Definitions of safety conflict situations
  - Reconstruction (digitalization) of crashes (& near-crashes) including surrounding traffic flow

- CAE simulations for impact assessment – Ongoing

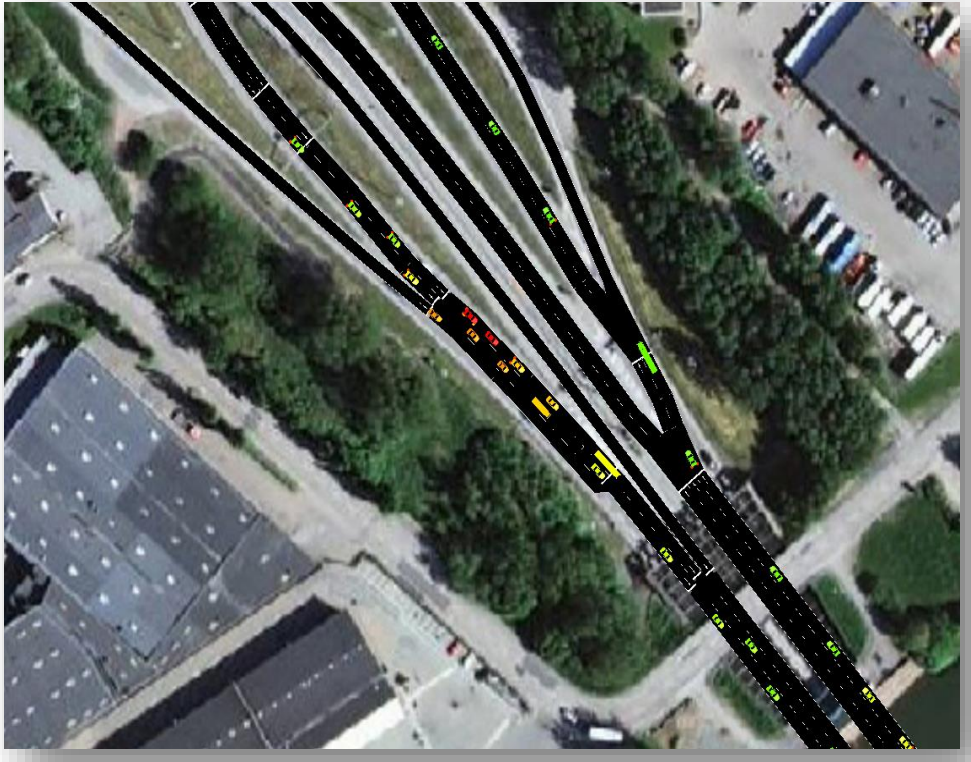
- WoZ experiments
  - Experiments & 1st paper – Completed
  - Further analysis & publication of 3 papers – Ongoing
    - Paper on subjective data analysis
    - Paper on glance behavior, crash involvement, trust
    - Paper on response process

ADFE – AUTONOMOUS DRIVE FUEL ECONOMY

- *”How can Energy Efficiency be improved with Autonomous Driving?”*

RESULTS BY SIMULATION

- SUMO - Simulation of Urban MObility.
- Open Source.
- Complete Drive Me road network
- Improved driver models
- Calibrated with real measured flows
- Emissions calculated from all cars



PRELIMINARY RESULTS

- Autonomous driving style is more energy efficient
- Increased share of AV may lead to increased congestion, and energy consumption
- Noise emission tend to follow energy efficiency results.

PUBLICATIONS

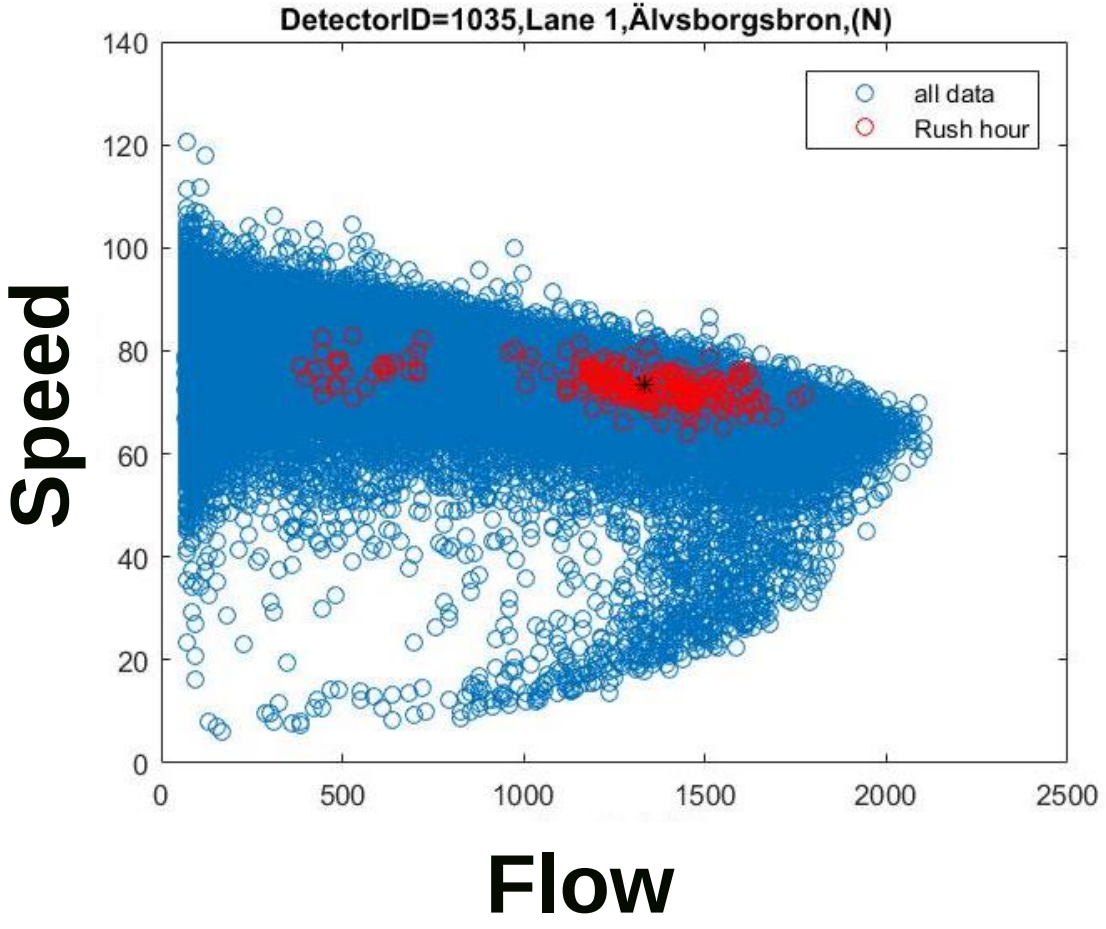
- ITEC 6th IEEE Transportation Electrification Conference and Expo, Chicago.
  ” Fuel Economy Assessment of Autonomous Vehicles Using Measured Data”

- IEEE Intelligent Vehicle Symposium (IV) 2017, Redondo Beach
  “Driver Behaviours Impact on CO2 and Traffic”

- SUMO User Conference 2017
  "Towards Simulation for Autonomous Mobility”

- Journal paper (not yet submitted):
  “Assessing the Energy Efficiency Impact of Autonomous Vehicles Using Traffic Simulation”

EXAMPLE OF REAL WORLD TRAFFIC MEASUREMENT - THE SHARK



THANK YOU FOR LISTENING

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