Federal Ministry
of Education
and Research

HIGHTECH STRATEGIE 2025
Köpfe. Kompetenzen. Innovationen.

Researching autonomous driving in Germany

Tokyo, 12 November 2019

Federal Ministry of Education and Research

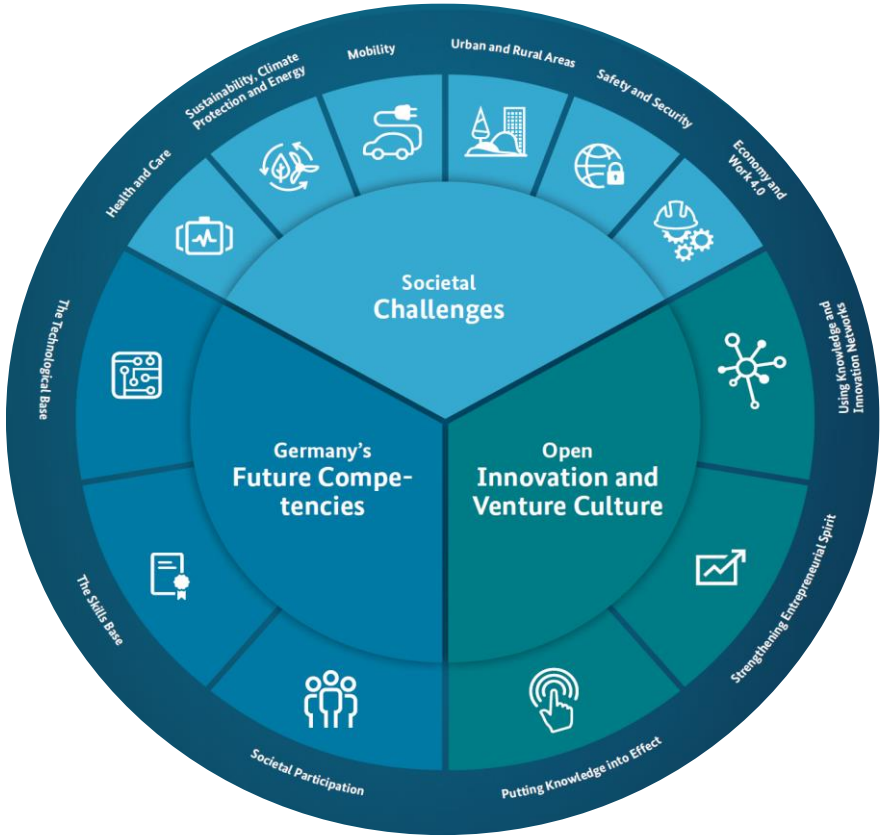
Division for
Electronics and Autonomous Driving

Mr. Reinhold Friedrich

www.bmbf.de
www.elektronikforschung.de

The High-Tech Strategy (HTS) 2025…

- …defines objectives and milestones of the German Innovation and Research policy.
- …focuses on the people.
- …is implemented in **close cooperation with all ministries**; furthermore enhanced cross-sectoral activities
- … underpins the goal to increase R&D expenditure to 3.5 %.
- Financial umbrella: more than 15 billions Euros in 2018
- …strengthens science, industry and SME by innovation-friendly frameworks and conditions.
- …considers **mobility of the future as an integrated system** and a **driver for technology**
- **Research on safe, connected and clean mobility** is one of the crucial areas of action of HTS 2025.



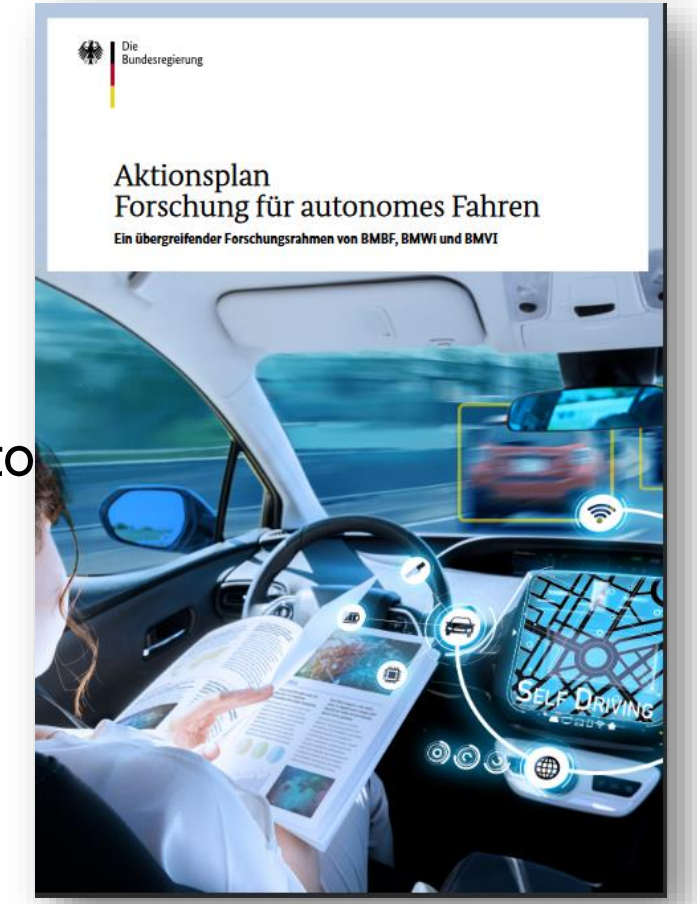
German Action Plan for Research on Autonomous Driving - Objectives

Federal Ministry of Education and Research

Federal Ministry for Economic Affairs and Energy

Federal Ministry of Transport and Digital Infrastructure

- Autonomous driving has to be safe and secure.
- Autonomous driving has to be efficient, sustainable, climate-friendly, accessible and affordable. It has to optimally answer to the needs of citizens.
- Research intensive key technologies and competencies, as e.g. AI, have to be strengthened in order to sustain the position of Germany within the global automobile industry.



German Action Plan for Research on Autonomous Driving - Focusses

Federal Ministry of Education and Research

Federal Ministry for Economic Affairs and Energy

Federal Ministry of Transport and Digital Infrastructure

- Federal Ministry of Education and Research
  electronics and sensors, AI and software technologies for autonomous vehicles, IT-security, technologies for human-machine-interaction
- Federal Ministry for Economic Affairs and Energy
  systemic aspects of means of transport, safety of autonomous driving systems, data fusion and data processing, testing and validation
- Federal Ministry of Transport and Digital Infrastructure
  infrastructure, traffic organization and management, societal aspects, testing

German Action Plan for Research on Autonomous Driving - Governance

Cross-ministerial steering committee for automated driving policy (Ressortrunde)
regular exchange and discussion between Ministries
Participating institutions: BMBF, BMWi, BMVI, BMI, BMJV

Expert committee on research for autonomous driving (Dialogforum)

Discussion between BMBF, BMWi, BMVI and representatives of academia and industry

National conference on research and technology for autonomous driving

Platform for exchange between publically funded R&D projects

Discussion of research & technology trends

Japanese-German research co-operation on connected and automated driving

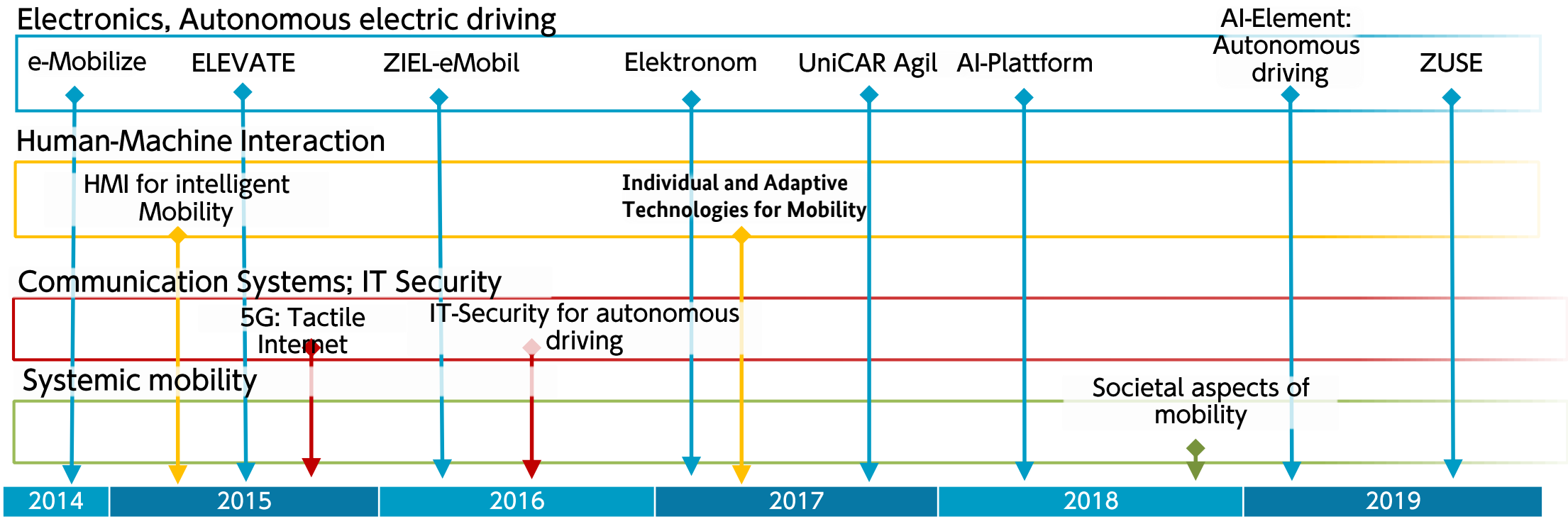
Exchange on government level for research funding

Participating institutions: BMBF, BMWi, CAO (Japan)

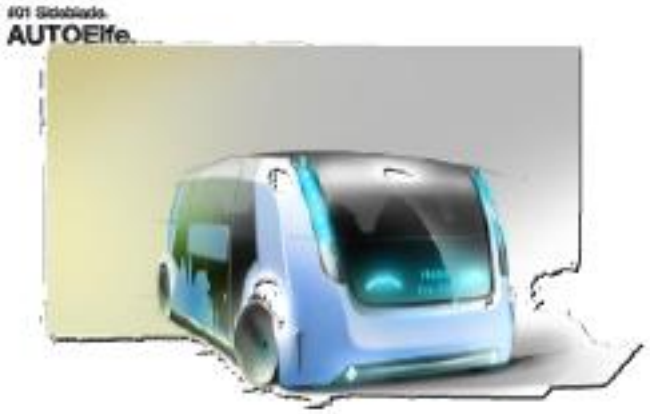
BMBF – Research Agenda "Autonomous Driving"

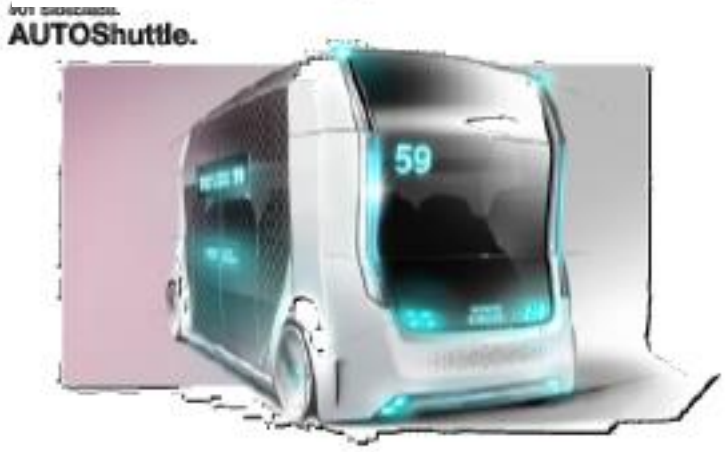
Funding of application-oriented research in electronics, artificial intelligence, human-machine-interaction, communication systems, IT security and systemic mobility

Since 2014: ˜150 Mio. €



Disruptive Modular Architecture for Agile, Automated Vehicle Concepts (UNICARagil)





- University driven research project on fully automated, driverless, electric vehicles
- modular and scalable vehicle concept
- expandable and updateable software and hardware architecture
- generic sensor modules for environment detection

Project details:

- Total BMBF funding 26 Mio. €
- 01.02.2018 - 31.01.2022

Partners:

13 partners coordinated by RWTH Aachen

www.unicaragil.de

Center for European Research on Mobility (CERMcity) – urban test environment for CAD

- Simulation of complex urban intersections
- Connectivity (4G and 5G, sat. nav. V2X through WLAN 802.11p)
- Full testing chain through driving simulator, test vehicle and testing ground
- Usage by industry and SMEs possible

Project details:

- Total budget 4 Mio. € (83% BMBF-funded)
- Scheduled for completion in 2019
- 3 partners and 3 associated partners coordinated by RWTH Aachen

www.futuremobilitycenter.de

Strategic International Cooperation

Japanese-German Research Co-operation on Connected and Automated Driving

CADJapanGermany: Societal Impact Assessment

- CAD market forecast and diffusion projections
- Societal acceptance and impact on society and industry

CADJapanGermany: Human Factors

- Communication between AVs and other road users
- Education and training for drivers
- Drivers' interaction with automated systems

Discussion of further project ideas in the fields Modelling, Simulation, Validation and Cybersecurity

and further…..

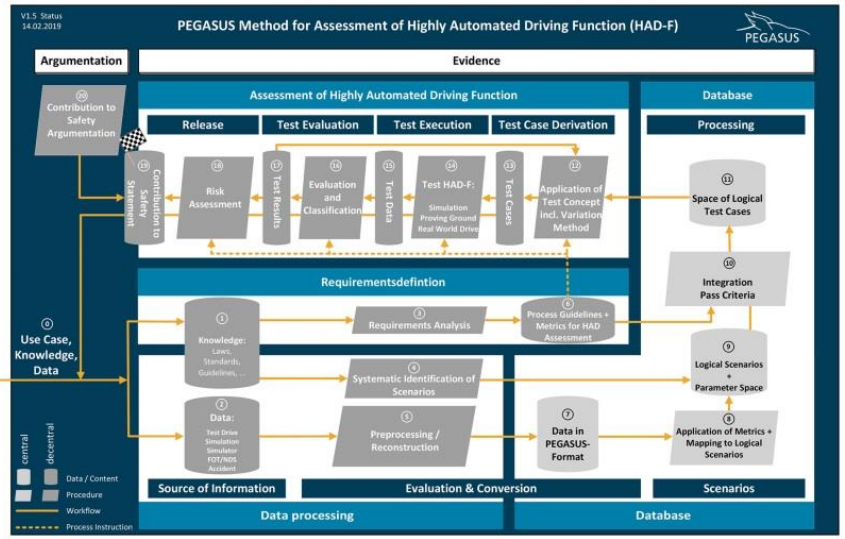
ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

Penta

BMWi - The Evolution of PEGASUS

PEGASUS

https://www.pegasusprojekt.de/en



01/2016 – 06/2019, 17 Partners, Vol. 35 Mio. €
Basic methodological framework
Focus: Level 3 on highways

2016 →

PROJECTs OF THE PEGASUS FAMLIY

SET Level 4to5

SET Level 4to5 provides a simulation platform, toolchains and definitions for simulation-based testing of L4/5 automation in urban environments

03/2019 – 08/2022, 20 Partners, Vol. 30 Mio. €

VV Methods develops methods, toolchains and specifications for technical assurance of L 4/5 automation in urban environments

07/2019 – 06/2023, 23 Partners, Vol. 47 Mio. €

+ future projects of the PEGASUS Family….

2019 →

BMVI - automated and connected driving in road traffic

Current call for projects on "future-proof and sustainable mobility system with automated and connected vehicles" (2019-2021)

- High automation levels, interfaces to other transport modes in complex applications, use of artificial intelligence
- Funding: 53 Mio. Euro

providentia

Proactive Video-Based Use of Telecommunication Technologies in Innovative Highway-Scenarios

- Enable comprehensive anticipatory view also in bad-weather-conditions
- V2I and I2V communication, digital twin in backend
- Funding: 6 Mio. Euro

www.testfeld-a9.de

Future research areas for autonomous driving for BMBF

Decisive elements for implementation of autonomous driving are:

a) Functional and operational safety and reliability

- Validation of AI functionalities
- Trustworthy electronics hardware

b) Energy efficient data processing and computing in the vehicle:

- Electronics for high performance and low-energy data processing inside the car

Autonomous driving will be one focus in the new framework programme for trustworthy electronics.

Further information

Federal Ministry of Education and Research
www.bmbf.de

Research on Microelectronics
www.elektronikforschung.de

Funding of small and medium-sized enterprises (SMEs)
https://www.bmbf.de/de/mittelstand-3133.html und www.kmu-innovativ.de

Programme to promote young scientists
https://www.elektronikforschung.de/nachwuchsfoerderung

Research Fab Microelectronics Germany (FMD)
www.forschungsfabrik-mikroelektronik.de

Federal Ministry of Transport and Digital Infrastructure
www.bmvi.de

Federal Ministry for Economic Affairs and Energy
www.bmwi.de

Thank you for your attention!

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