



Delft University of Technology

## Automated Driving Research in the Netherlands (PPT)

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# AUTOMATED DRIVING RESEARCH IN THE NETHERLANDS

## 自动驾驶的影响

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Automated Driving Research in the Netherlands  
Workshop Sino-Dutch Cooperation in Transport, Beijing, 21-22 April 2016



## Outline

- Policy framework and projects by the ministry of Infrastructure and Environment
- Projects at Delft University of Technology
- Outlook



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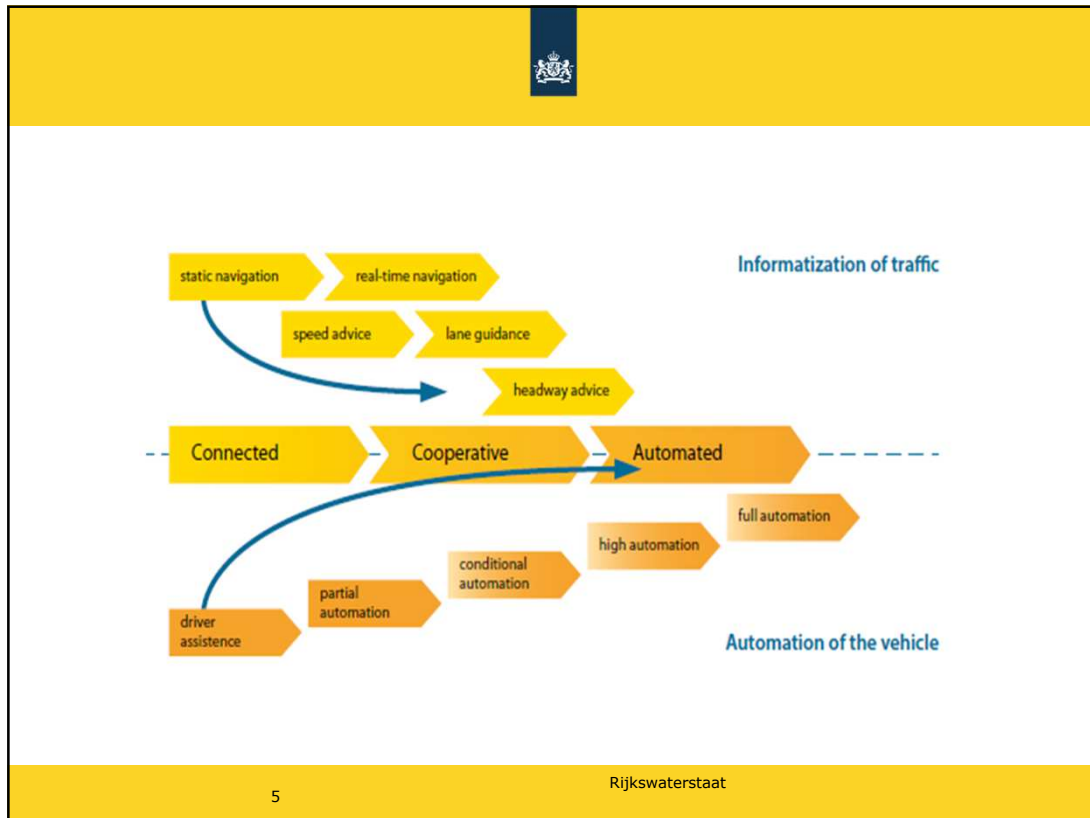


## The Netherlands



## Our ambition





## The Netherlands is a suitable country for these innovations

- High quality infrastructure and dense use of infrastructure
- Positive cooperation between business (automotive industry), knowledge institutes (research) and government:
  - Dutch integrated testsite for cooperative mobility (DITCM)
  - Dutch Automated Vehicle Initiative (DAVI)
- Experience with autonomous driving and vehicle to vehicle communication:
  - Demo '98
  - Cooperative ITS Corridor Rotterdam-Frankfurt-Vienna
  - Practical Trial Amsterdam



## Working group “the Self Driving Car”

- Ministry of Infrastructure & the Environment
  - Rijkswaterstaat, national road operator
  - RDW, type approval authority
1. Adjustment of (inter)national law
  2. Facilitate large-scale practical tests
  3. International efforts to make deployment a reality
  4. Stimulating and developing knowledge

### People

- 20.000 BSc and MSc students
- 2.700 Scientific staff members

### Ranking

- Times Higher Education ranking 71
- Part of Leiden (64) –Delft – Erasmus (Rotterdam, 72) federation

### Faculties

- Physics
- Mathematics, electronics, information science
- Civil Engineering and Geosciences
- Mechanical, Maritime and Materials Engineering
- Aerospace Engineering
- Industrial design
- Architecture
- Technology, policy and management

**TU Delft**

## Dutch Automated Vehicle Initiative (DAVI)

Stimulates research and development of automated vehicles on public roads.

Focus on traffic and system safety, human factors and impact assessment.

Network organization open for parties that want to work together to achieve DAVI goals.

Instruments:

- Thematic meetings (human factors, ethics, insurance, infrastructure,...)
- Project initiation and execution
- Liaison with public authorities



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## DAVI Demo 2013



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Core partners

Charter partners





























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## Human Factors and Automated Driving (HF Auto)



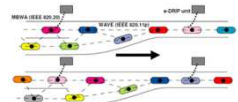
**Human factors**

- Transitions of control
- Acceptance, trust
- Use & misuse
- Interaction with other road users

**Legal and market perspectives**


Partners HFAuto	
Full Partners	Associated Partners
Delft University of Technology	Volvo Technology Cooperation
Technische Universität München	Volvo Car Corporation
University of Southampton	BMW
University of Twente	Jaguar
Chalmers University of Technology	Toyota Motor Europe
IFSTTAR (France)	Continental
VTI (Sweden)	TNO
	SWOV

3.6 M € ITN Marie Curie FP7 2013-2017

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## Driverless shuttles



*World first automated shuttle in mixed traffic with cyclists and pedestrians.*

*TU Delft and DAVI partners, 2014-2016.*



provincie  
**GELDERLAND**



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## Driverless shuttles

- *Experimental driverless last mile transport between Train Station Delft-Zuid and TU Delft campus*
- *Dual mode: manual operation, automatic relocation on cycling paths*



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## Cooperative Motorway Driving



radar, camera, localization, telematics and drive-by wire  
experimental research into cooperative motorway driving

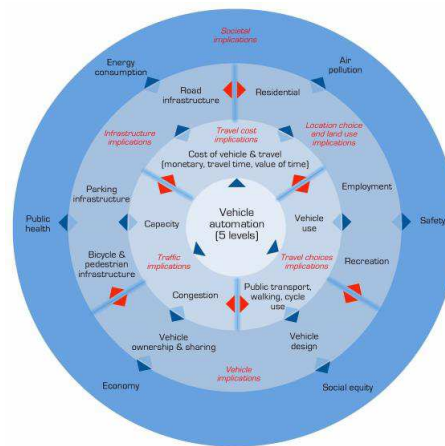
Duration 2014-2019; Budget 3M€



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## Societal impacts of Automated Driving

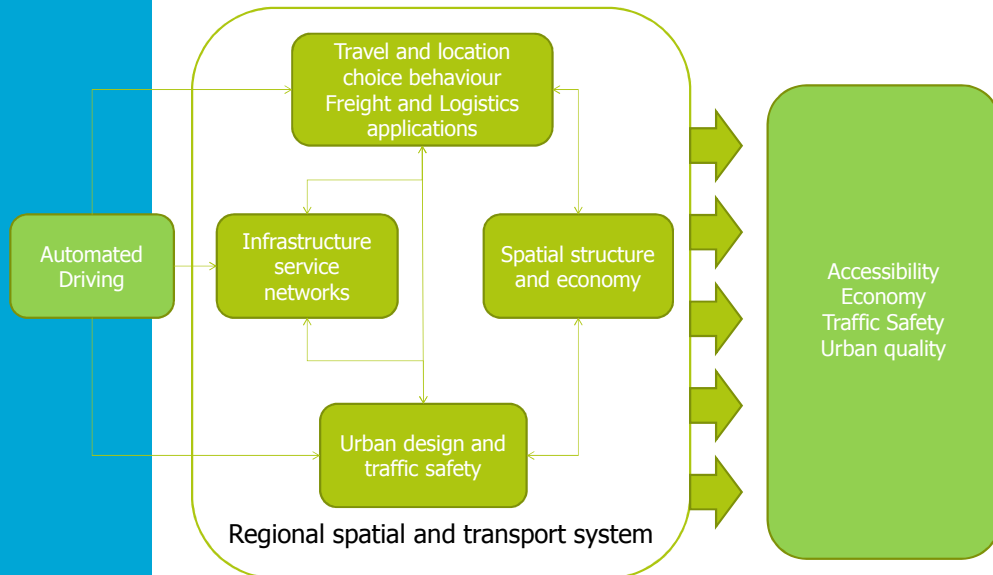


Much progress short term and small scale impacts on driver behaviour and traffic flow.

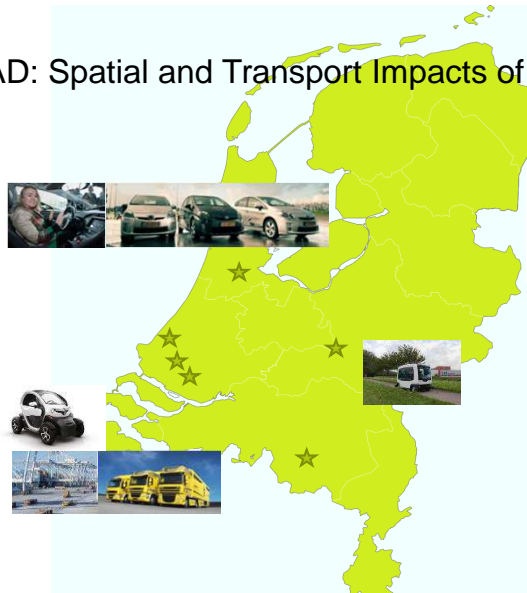
Research on longer term, indirect, wider scale impacts on mobility, logistics, residential patterns and spatial-economic structure in its infancy.



## Scientific challenges: understanding the spatial and transport changes



## STAD: Spatial and Transport Impacts of Automated Driving



**APPROVED**



Informal Transport meeting, Amsterdam, April 14-15, 2016

Rijkswaterstaat



## Experience



Rijkswaterstaat



## Experience



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## EU Truck Platooning Challenge



Rijkswaterstaat



**EU**  
**2016**

Rijkswaterstaat





## Knowledge agenda

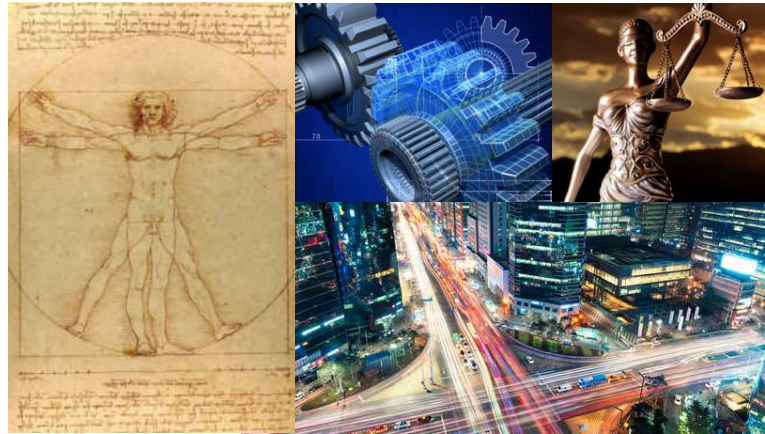
Legal

Technical

Human Factors

Impact

Deployment



<http://knowledgeagenda.connekt.nl/engels/>

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Rijkswaterstaat



## Declaration of Amsterdam



<http://english.eu2016.nl/documents/publications/2016/04/14/declaration-of-amsterdam>



Rijkswaterstaat





## Joint effort

- **Shared conceptual framework and phasing on (highly) automated/ autonomous and connected/cooperative driving**
- **Adapt and make compatible international legislation so that it allows automated, autonomous and connected driving**
  - E.g. Vienna Convention, traffic law, liability, privacy laws.
  - Informal working groups?
- **Focused investments in research, infrastructure, technology, ..**
- **Set (research) agenda for:**
  - Legal issues (privacy, liability, traffic law,...)
  - Data (ownership, exchange, infrastructure, harmonisation, security, maps, ...)
  - ....

Rijkswaterstaat



## Joint effort

- **Facilitate a continuous dialogue**
  - Member States, European Commission , Industry and knowledge institutes
  - on (highly) automated, autonomous systems and its integration with C-ITS.
  - linking together existing platforms and give them a joint focus Eg. C-ITS platform DG Move
  - allow flexibility and a plurality of approaches
- **Learning by doing: provide large scale cross border possibilities to test on public roads across Europe**
  - define cross border corridors + urban networks (cities) to test
  - guiding principles on a joint exemption (procedure), agreements on mutual recognition,
  - give insight in the possibilities within Europe to test.
- **Develop joint agenda/ learning on relevant topics:**
  - Ensure new services and systems are compatible on a EU level
  - Ensure privacy and data ownership
  - Harmonize security policies
  - Focus investment strategies for industry and Member States attuned to these developments
- **Connecting to current activities**
  - C-ITS platform, Amsterdam Group, various (inter)national activities)

Rijkswaterstaat

## The road to automated driving...

Develop efficient and reliable technology



Collect, analyse and publish large scale real-world experience



Study spatial, transport and societal impacts



Regulations, type approval



Awareness, ambitions, expectations, reality checks



International cooperation



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## THANK YOU!

