



# EU Initiatives and Research for Automated Driving and Occupant Safety

***3<sup>rd</sup> International VDI Conference***

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European Commission

# Mobility & Freedom...



Reality...





## Mobility & Freedom...



## Reality...



Research and  
Innovation

## Improve Road Safety – A European policy objective

...halving road deaths by 2020

*... move close to zero deaths and  
serious injuries by 2050*

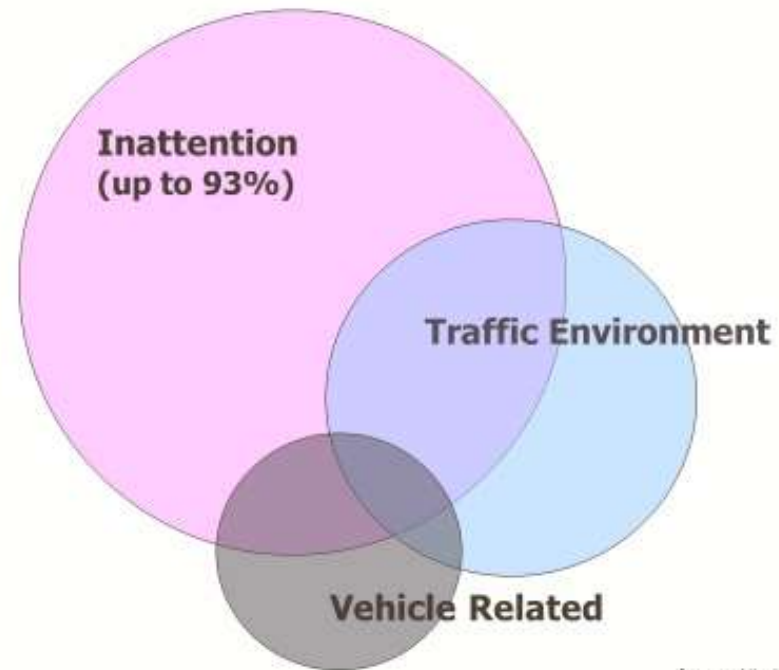


## Connected & Automated Cars... Why?



- Increased road safety and less fatalities
- Less traffic jams
- Better traffic management
  
- *Lower fuel consumption and environmental impact*
- More efficient use of existing road infrastructure
- *Less need for urban parking spaces*
- Reduced costs of future infrastructure and equipment
- *Better accessibility for certain user groups*
- More individual comfort for users

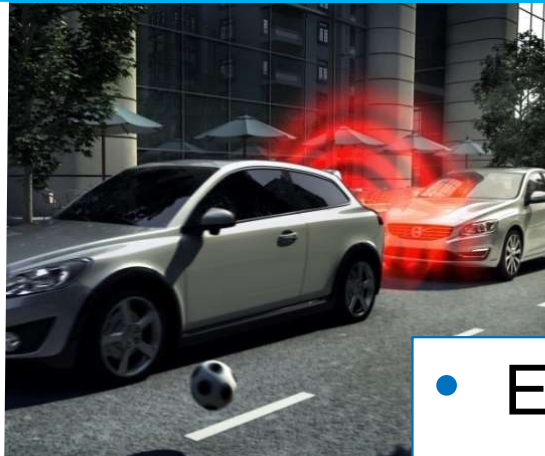
## The Reality - What Causes Accidents?



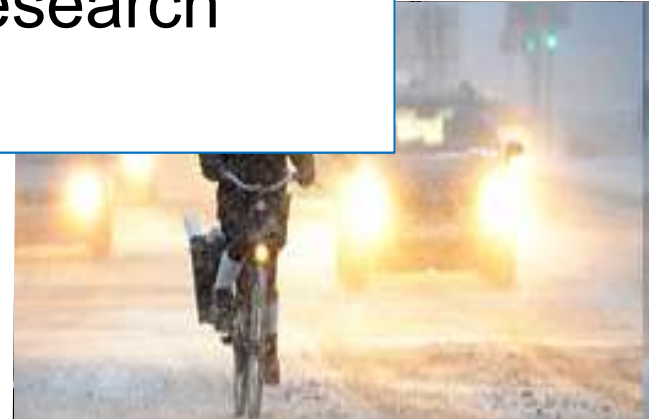
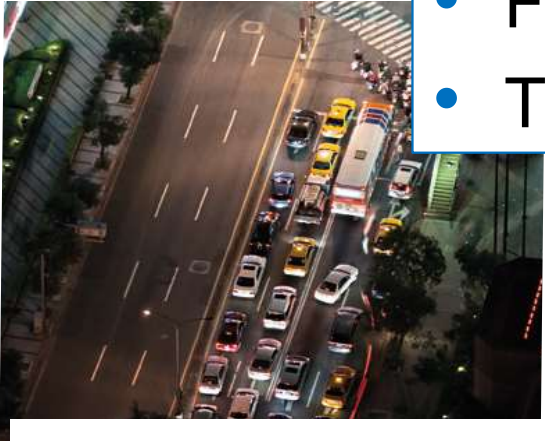
Source: Virginia Transportation Institute

ESV June 2007 - Panel on Unsafe Driver Behavior  
Ingrid Skogvang

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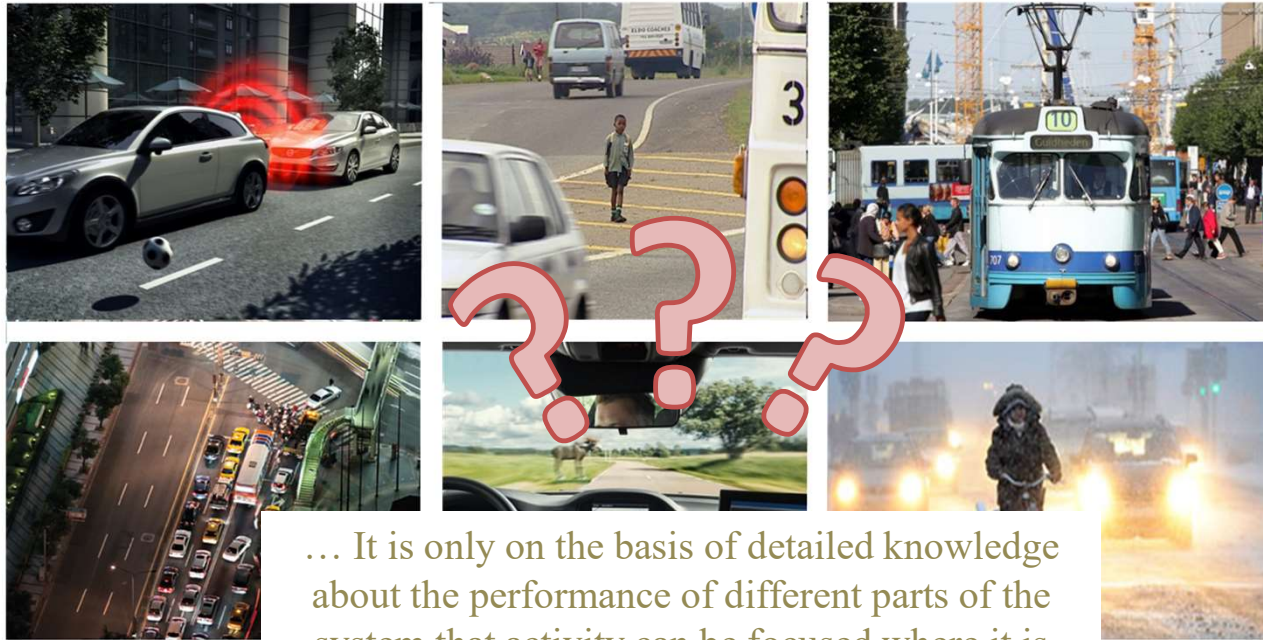


- Enable – Policy
- Find solutions -- Research
- Try out in reality









... It is only on the basis of detailed knowledge about the performance of different parts of the system that activity can be focused where it is most effective in reducing deaths and serious injuries...

# Automated mobility



Research and  
Innovation



European Union  
Transport  
Ministers  
Meetings



## I SHARED OBJECTIVES

SUPPORTING the following objectives:

- a. to work towards a coherent European framework for the deployment of interoperable connected and automated driving, which should be available, if possible, by 2019;
- b. to bring together developments of connected and automated driving in order to reach their full potential to improve road safety, human health, traffic flows, and to reduce the environmental impact of road transport;
- c. to adopt a "learning by experience" approach, including, where possible, cross-border cooperation, sharing and expanding knowledge on connected and automated driving and to develop practical guidelines to ensure interoperability of systems and services;
- d. to support further innovation in connected and automated vehicle technologies to strengthen the global market position of European industry; and
- e. to ensure data protection and privacy.

## II JOINT AGENDA



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# Horizon 2020 Work Programme for Research & Innovation



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## *HORIZON 2020 – WORK PROGRAMME 2014-2015*

### **Societal challenges**

8. Health, demographic change and wellbeing
9. Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy
10. Secure, clean and efficient energy
11. Smart, green and integrated transport





*HORIZON 2020 – WORK PROGRAMME 2014-2015*



**Societal challenges**

**3. ROAD .....**

- MG.3.1-2014. Technologies for low emission powertrains.....
- MG.3.2-2014. Advanced bus concepts for increased efficiency.....
- MG.3.3-2014. Global competitiveness of automotive supply chain management .....
- MG.3.4-2014. Traffic safety analysis and integrated approach towards the safety of Vulnerable Road Users
- MG.3.5-2014. Cooperative ITS for safe, congestion-free and sustainable mobility.....
- MG.3.6-2015. Safe and connected automation in road transport .....



*HORIZON 2020 - Work Programme 2016 - 2017  
Smart, green and integrated transport*



<b>3. SAFETY</b> .....	<b>Call - 2016-2017 Automated Road Transport</b> .....	<b>73</b>
MG-3.1-2016: Addressi	ART-01-2017: ICT infrastructure to enable the transition towards road transport automation .....	74
MG-3.2-2017: Protection	ART-02-2016: Automation pilots for passenger cars .....	76
MG-3.3-2016: Safer wat	ART-03-2017: Multi-Brand platooning in real traffic conditions .....	78
MG-3.4-2016: Transport modal and intermodal le	ART-04-2016: Safety and end-user acceptance aspects of road automation in the transition period.....	79
MG-3.5-2016: Behaviou	ART-05-2016: Road infrastructure to support the transition to automation and the coexistence of conventional and automated vehicles on the same network .....	81
MG-3.6-2016: Euro-Afr	ART-06-2016: Coordination of activities in support of road automation.....	82
	ART-07-2017: Full-scale demonstration of urban road transport automation.....	84



## **ART-04-2016: Safety and end-user acceptance aspects of road automation in the transition period**

Specific Challenge: Automated vehicles will be accepted by customers and society only when they will be deemed easy-to-use and fully reliable and safe regarding the planned manoeuvres and their execution. A key challenge is to ensure safe vehicles handling with reduced driver attention. Especially for level 3 automated driving systems an effective interaction between

—Reducing the number of accidents caused by human errors, such as inattention and distraction. Research will therefore help to achieve the European policy objective of halving road deaths by 2020, and, in the longer term, the Transport White Paper "Vision Zero" objective by preventing road accidents caused by human errors.

—Maintaining the leadership position in developing user-centric, safe and reliable vehicle automation systems by the European vehicle manufacturers and their suppliers.





**ART-04-2016: Safety and end-user acceptance aspects of road automation in the transition period**





## **ART-02-2016: Automation pilots for passenger cars**

Specific Challenge: It is expected that automated vehicles at automation level 3 (Conditional Automation) will enter the market by 2020 to 2025. In the past years, there have been significant efforts in research to develop the technologies for vehicles and infrastructure to enable automated driving functions. However, substantial challenges remain on the path to European wide deployment. There is a great need to demonstrate the technological readiness:

Expected Impact: Actions are expected to demonstrate the technological readiness, reliability and safety of the automated driving functions in a large scale pilot at European scale. They will test automated vehicles at automation level 3 (including possible additional functions towards automation level 4) in mixed traffic situations. Actions are expected to demonstrate



# **L3 Pilot** *Driving Automation*

Feb 16, 2018








**1,000**  
drivers

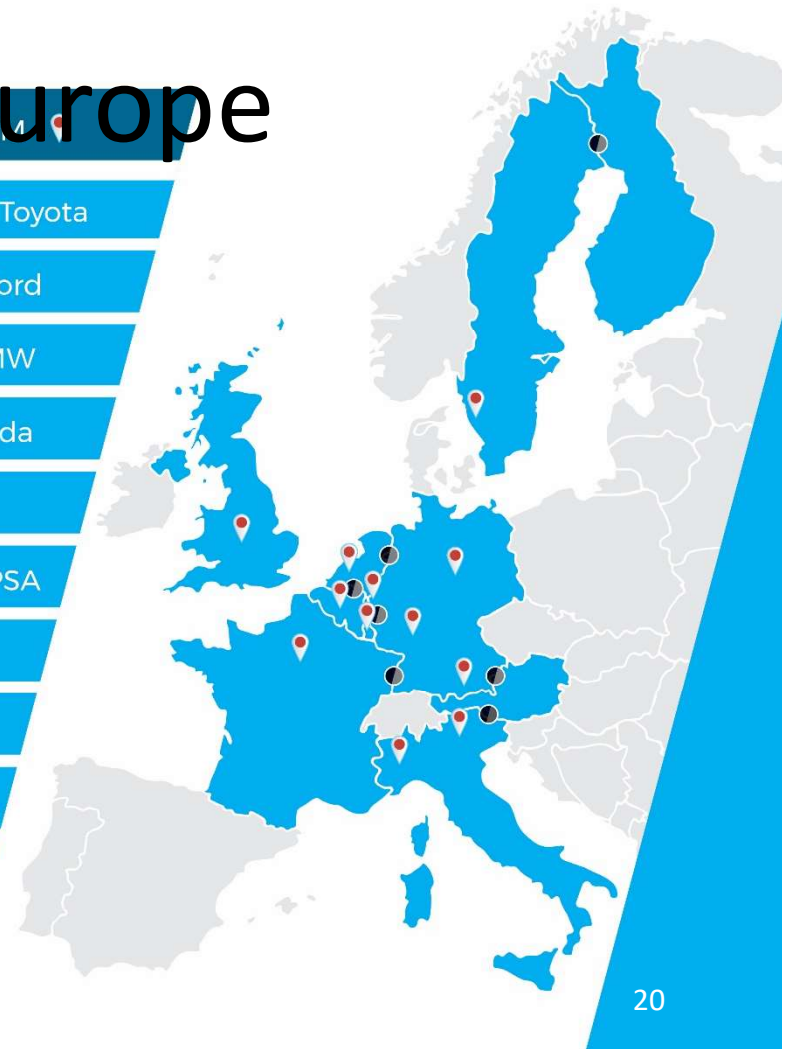
**100**  
cars

**10**  
countries

# Pilot across Europe

COUNTRY REGION OEM

CROSSBORDER		COUNTRY REGION	OEM
		BE / Brussels / NL	Toyota
		DE / Aachen	Ford
		DE / Munich	BMW
		DE / Offenbach	Honda
		DE / Wolfsburg	VW
		FR / Paris and other regions	REN / PSA
		IT / Turin and Trento	CRF
		LU / NL	Delphi
		SE / Gothenburg	Volvo
		UK / Coventry	JLR
	Austria	Germany	
	Austria	Italy	
	Belgium	Germany	
	Belgium	Netherlands	
	Finland	Sweden	
	France	Germany	
	Germany	Netherlands	



Feb 16, 2018



***Motorway***



***Traffic Jam***



***Urban***



***Parking***

**1,000** drivers

**100** cars

**10** European countries

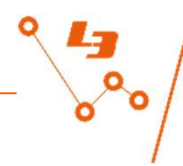
# Objectives:



## *Evaluation*

- technical aspects,
- user acceptance,
- driving and travel behavior,
- impact on traffic and society.

- Develop tools for effective analysis and evaluation of field data
- Enhance impact assessment simulation tools



## *Code of Practice*

### **for Automated Driving:**

- a comprehensive guideline
- hands-on checklists
- best practices for functions development

- Include safety aspects and methods to confirm a safe operation of Automated Driving functions



**ART-01-2017: ICT infrastructure to enable the transition towards road transport automation**

**ART-03-2017: Multi-Brand platooning in real traffic conditions**

**ART-07-2017: Full-scale demonstration of urban road transport automation**

Specific Challenge: Fully automated road transport systems have the potential to revolutionize urban transport offering high quality public transport services which are not feasible with conventional public transport systems. Low speed full automation systems have been demonstrated in several European cities. However full-scale demonstrations are still necessary to prove the reliability, safety and robustness of fully automated road transport systems in complex scenarios in urban areas. In addition, it is necessary to address the remaining



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# Horizon 2020 Work Programme for Research & Innovation 2018-2020



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## MG - AREA 2

Safe, integrated and resilient transport systems

2018 Total EU contribution: **EUR 73 Mio**

Topic	Title	Action type	Stages	Budget		
				2018	2019	2020
MG-2-1	<b>Human Factors</b> in Transport Safety	RIA	2	18.00		
MG-2-2	<b>Marine</b> Accident Response	IA/RIA	2	35.00		
MG-2-3	Airworthiness of <b>mass-market drones</b>	CSA	1	3.00		
MG-2-4	Coordinating national efforts in modernizing <b>transport infrastructure</b> and provide innovative <b>mobility services</b>	CSA	1	1.00		
MG-2-5 <i>InCo flagship 2</i>	Innovative technologies for improving <b>aviation safety</b> and certification in <b>icing conditions</b>	RIA	1	16.00		
MG-2-6	Moving freight by Water: <b>Sustainable Infrastructure</b> and <b>Innovative Vessels</b>	RIA	2		30.00	
MG-2-7	<b>Safety</b> in an evolving <b>road mobility</b> environment	RIA	2		8.00	
MG-2-8	Innovative applications of <b>drones</b> for ensuring <b>safety transport</b>	RIA	2		15.00	
MG-2-9 <i>InCo flagship 3</i>	Integrated multimodal, <b>low-emission freight transport</b> systems and <b>logistics</b>	RIA	2		14.00	

**MG-2.1-2018**  
**(RIA)**



## **Human Factors in Transport Safety**

### Challenge:

Human factors largest cause of accidents

Use automation to reduce impact of human factors

Scope: *(one of the following sub-topics).*

- A. Investigate safe human performance, demographic diversity, develop recovery/mitigation solutions, improve compliance with/formulation of safety rules
- B. Assess risk factors for waterborne &/or air transport in extreme situations. Compile data to use in risk based design & safety assessment. Guidelines for accident reporting.

Cross-modal transfer. Authorities e.g. EASA can be involved

### Expected impact:

Significant decrease in human factor related incidents.

Improve rules, selection and training of operators.

Contribute to UN's ICAO, IMO, SusDev and EMSA goals

Estimated EC contribution per proposal: € 4-8 million

InCo-related: Encouraged (incl. collaboration with neighbouring countries )

**MG-2.7-2019**  
(RIA)



## Safety in an evolving road mobility environment

### Challenge:

A changing road mobility environment (e.g. increasing automation)

Safety systems need to adapt to future potential collisions, future occupant positioning

### Scope:

- Develop robust solutions in the context of the changing environment, leading to dramatic improvements in transport users' and road workers' safety.
- Articulate traffic safety in terms that are relevant for connected & automated transport systems.
- Develop tools and models simulating traffic scenario's expected changes over time
- Design of (active/passive) protection systems for future collision scenarios
- Develop (physical &/ digital) infrastructure, on-vehicle solutions, education & training

### Expected impact:

>10% reduction in injuries and fatalities in road accidents

Optimal protection systems enabling occupants' new positions & perceive benefits with automation

Safer use of vehicles, effective education and training schemes

Estimated EC contribution per proposal: € 3-6 million



## WP 2018 Call: Automated Road Transport (ART)

2018 Total EU contribution: **EUR 15 Mio**

Topic	Title	Action type	Stages	Budget		
				2018	2019	2020
<b>DT-ART-01</b> <i>InCo flagship 4</i>	Testing, validation and certification procedures for highly automated <b>driving functions</b> under <b>various traffic scenarios</b> based on pilot test data	RIA	1	6.00		
<b>DT-ART-02</b> <i>InCo flagship 4</i>	Support for <b>networking activities</b> and <b>impact assessment for road automation</b>	RIA	1	6.00		
		CSA	1	3.00		
<b>DT-ART-03</b> <i>InCo flagship 4</i>	Human centred design for the new <b>driver role in highly automated vehicles</b>	RIA	1		8.00	
<b>DT-ART-04</b> <i>InCo flagship 4</i>	Developing and testing shared, <b>connected and cooperative automated vehicles fleets in urban areas</b> for the mobility of all	IA	1		30.00	
<b>DT-ART-05</b>	Efficient and safe <b>connected and automated heavy duty vehicles</b> in real logistics operations					
<b>DT-ART-06</b>	Large-scale, cross-border demonstration of highly automated driving functions for <b>passenger cars</b>					



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## Human centred design for the new driver role in highly automated vehicles



### Challenge:

SAE automation level 4 dramatically changes the traditional driver role

Develop solutions to ensure

- safe transfer between use cases with different automation levels and
- that drivers always have a very clear understanding about the degree of automation enabled in each situation.

### Scope:

- Design of safe human-machine interfaces for SAE level 4 driving functions, and safe, controlled transfer to/from use cases with lower SAE level - for all types of drivers.
- Characterise driver role, update models and tools
- Demonstration of functionality in real world situations

### Expected impact:

Innovative solutions for drivers/operators to be adequately alerted and engaged

Reduction of risks for driver behaviour related incidents

Contribution to Vision Zero casualty reduction targets.

Estimated EC contribution per proposal: € 4-8 million



**ART-01-2018 (RIA)**



Multilateral International Cooperation encouraged, in particular

**Australia**

**Japan**

**Singapore**

**South Korea**

**US**

*(InCo Flagship "Automated Road Transport")*

## Testing, validation and certification procedures for highly automated driving functions under various traffic scenarios based on pilot test data

Challenge:

- How can we prove that new automated driving functions are really safe and reliable?

Scope:

- Develop testing and validation procedures of highly AD functions for different use cases in various traffic scenarios
- Research on merging simulation/virtual testing with real tests
- Common criteria for model-based validation and simulation on vehicle, components and V2X communication systems level

Expected impact:

- Comprehensive testing, validation and certification procedures for highly AD functions to pave the way for accelerated implementation of highly automated vehicles in Europe

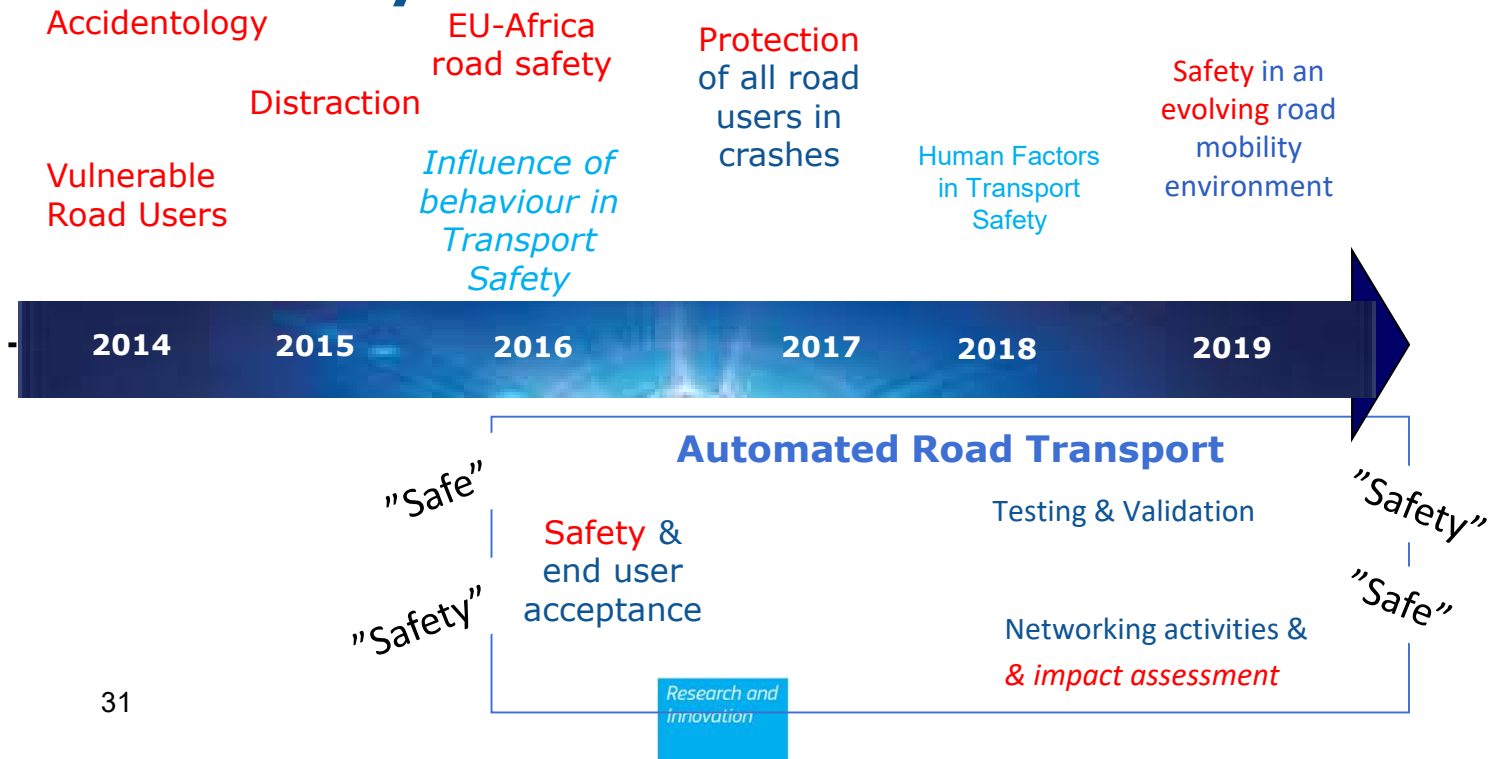
Estimated EC contribution per proposal: EUR 4-6 Mio

InCo-related: Yes





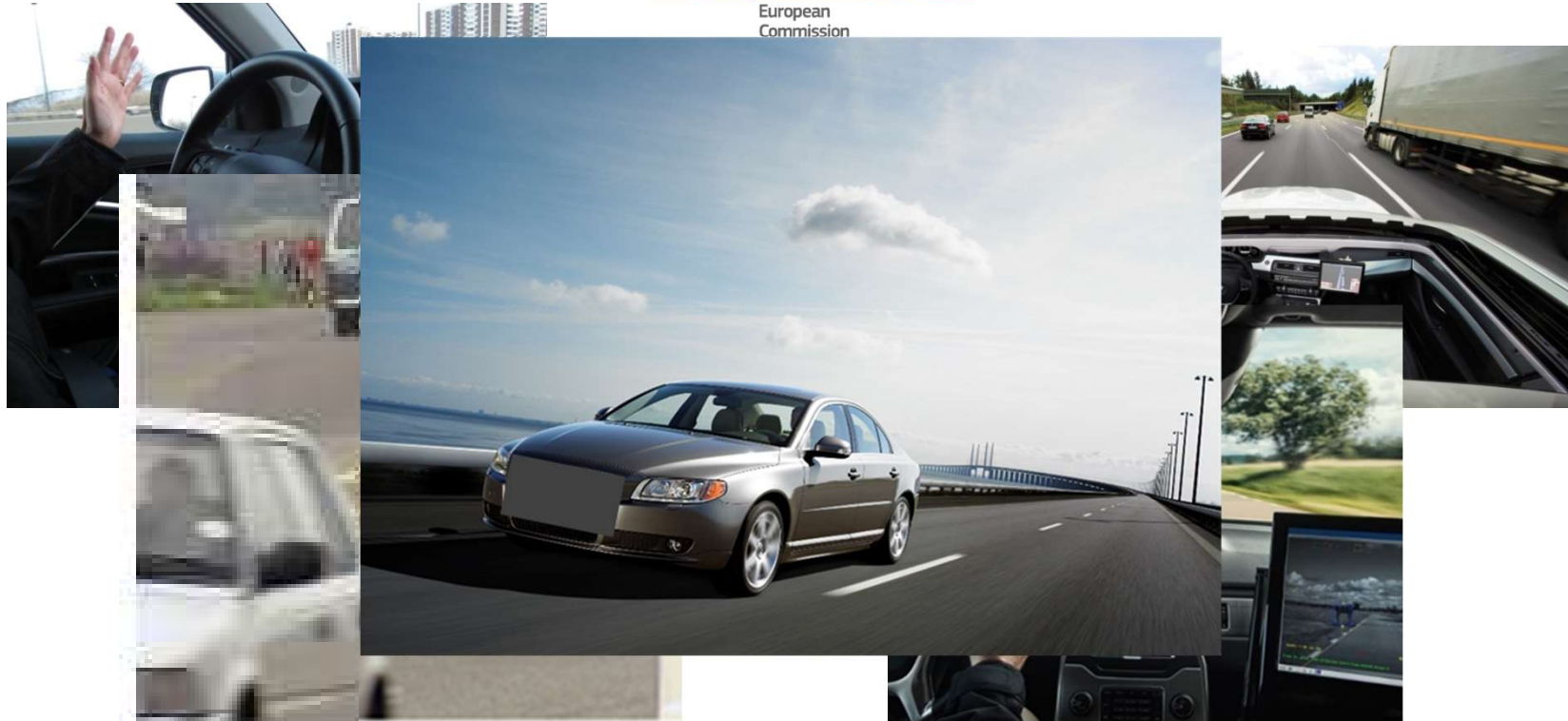
# Road Safety in Horizon 2020



# Future Generations Cars and Drivers



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*Thank you for your attention!*