



# Shaping the Future: How vehicle technology enhances safety

PACTS Spring Conference 2025

**TRL** THE FUTURE  
OF TRANSPORT



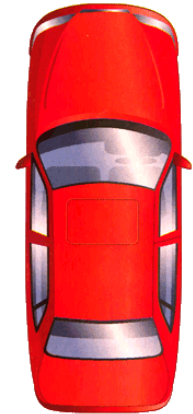
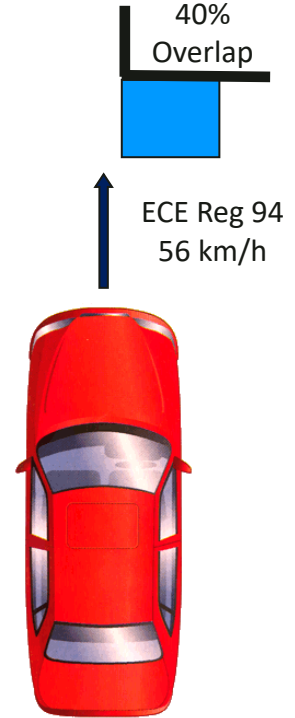
**Richard Cuerden**  
Director, TRL

# How vehicle technology enhances safety

## Minimum international car safety Regulations

- **Frontal impact**
  - UN Regulation 94. US Regulation FMVSS 208 is considered equivalent
- **Side impact**
  - UN Regulation 95. US Regulation FMVSS 214 is considered equivalent
- **Electronic Stability Control**
  - UN Regulation 13H. US Regulation FMVSS 126 is considered equivalent
- **Pedestrian protection**
  - UN Regulation 127
- **Seat belts and belt anchorages**
  - UN Regulations 14, 16. US Regulation FMVSS 210 is considered equivalent
- **Child restraints**
  - UN Regulations 44 and 129. US Regulation FMVSS 213 is considered equivalent

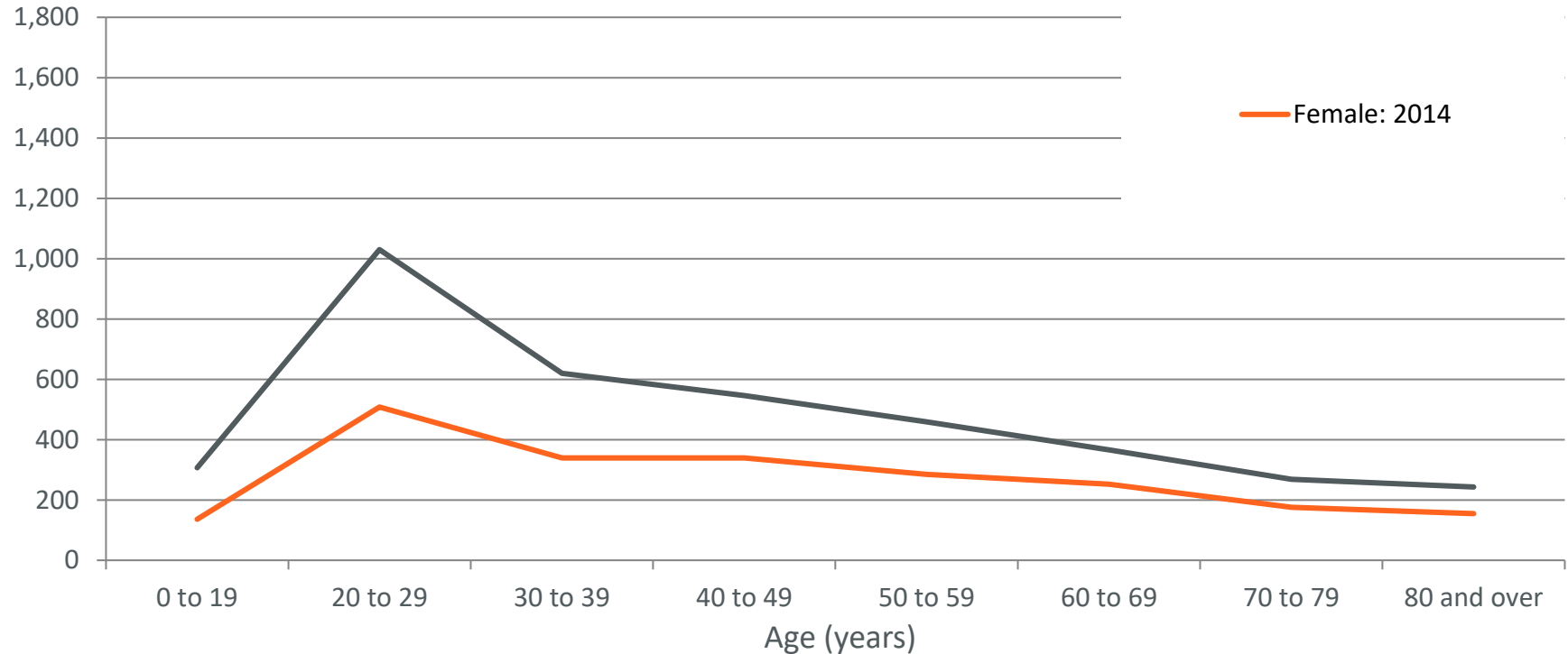
**All standard in UK circa 2014**



# How vehicle technology enhances safety

## The GB casualty challenge

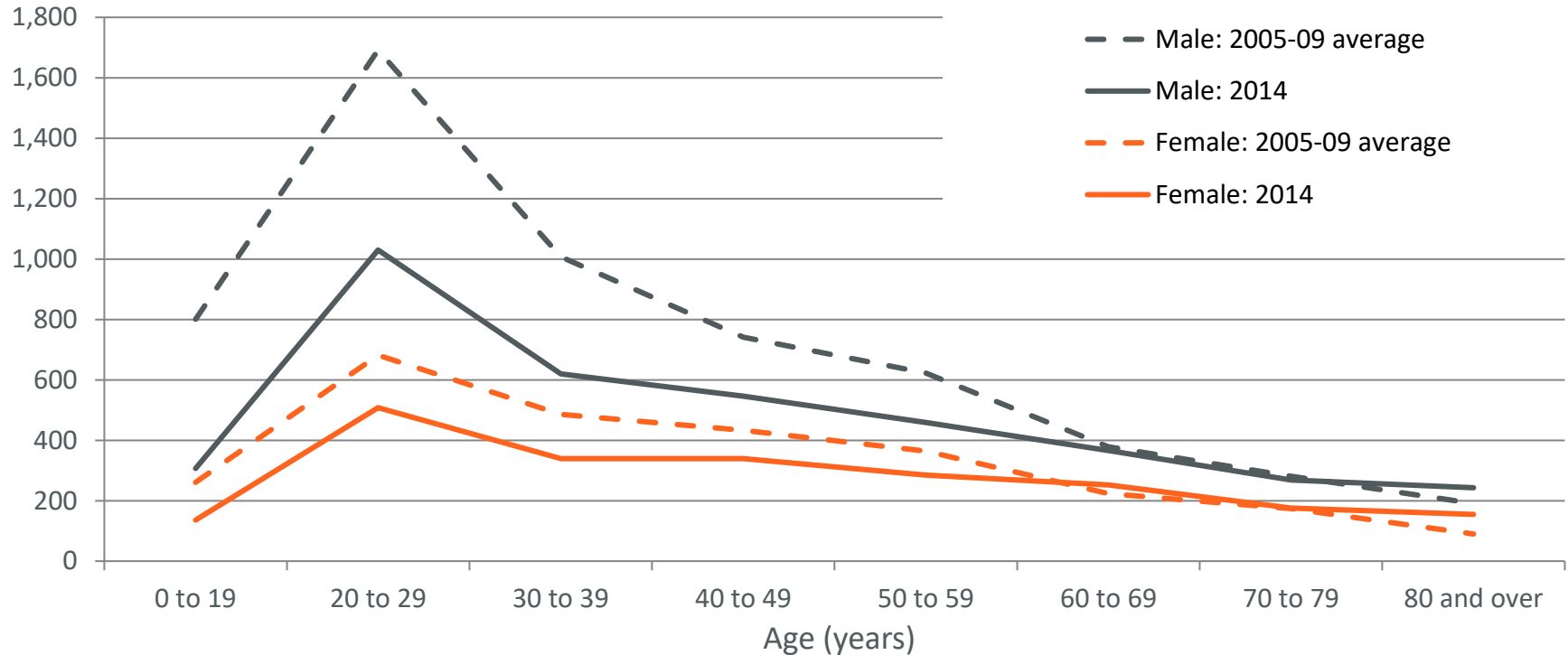
Reported number of KSI car drivers 2014



# How vehicle technology enhances safety

## The GB casualty challenge

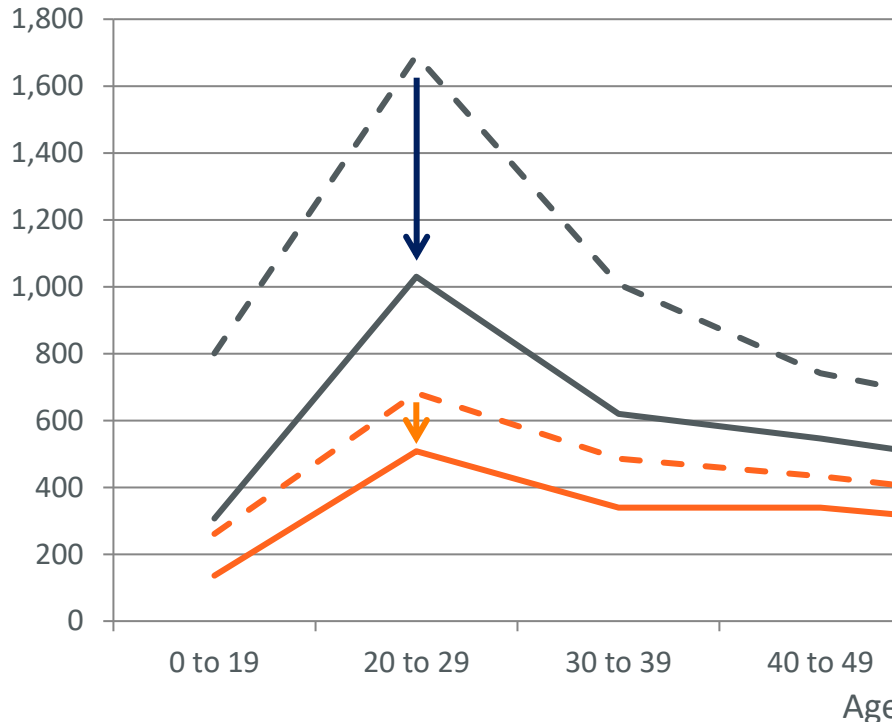
Reported number of KSI car drivers 2014



# How vehicle technology enhances safety

## The GB casualty challenge

Reported number of KSI car drivers 2014



### Car driver casualty reduction:

- Largest reduction for younger males
- No evidence of changes in exposure
- Improved vehicle safety and more young and inexperienced drivers in safer cars
  - Cuerden *et al.* (2015) estimated that **secondary safety** alone, from 2002, has **prevented 11% of driver fatalities**
- Improved driver behaviour
  - Education/ Enforcement/ Testing/ Telematics insurance policies?
- Improved road design
- +++

# How vehicle technology enhances safety

## General Safety Regulations and Pedestrian Safety Regulations

- **2014-21:** TRL supported the EC developing requirements and test procedures



- **25 March 2019:** The EU institutions reached a provisional political agreement on the revised GSR and PSR
- **16 April 2019:** Positive **vote in the European Parliament** on the revised GSR and PSR (proposed by the Commission in May 2018)
- **16 December 2019:** EC Journal Publication
- **5 January 2020:** Entry into force
- **5 July 2022:** Mandatory date for EU27
- **5 July 2024:** All new vehicles for EU27

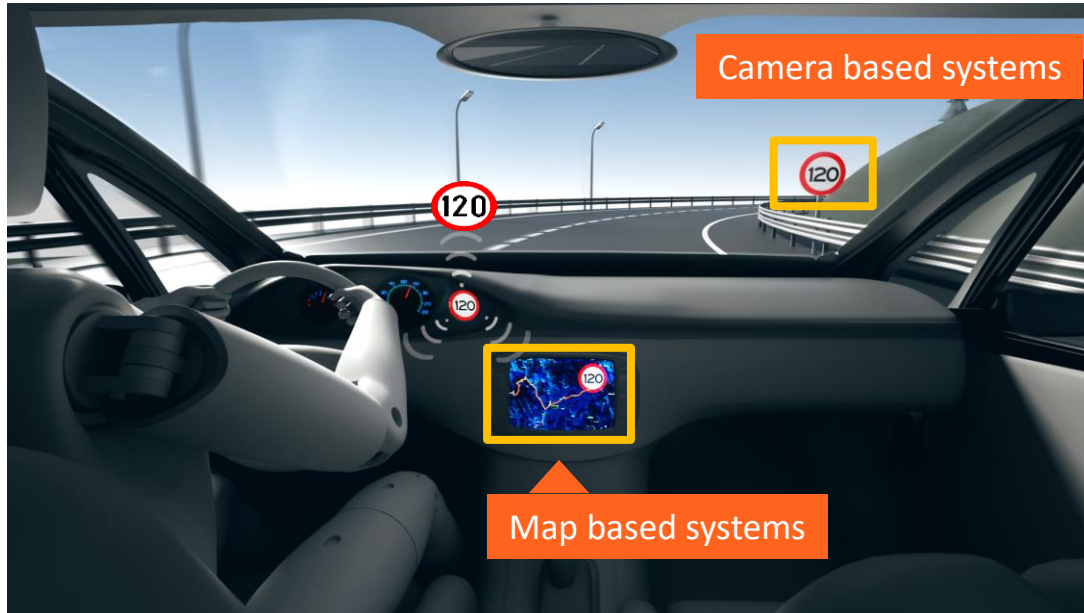
# How vehicle technology enhances safety

Code	GSR and PSR Measure name	Vehicle categories
AEB	Advanced Emergency Braking (light duty, vehicles and pedestrians/cyclists)	M1, N1
DDR	Driver Drowsiness and Attention Monitoring (DDAM), Advanced Distraction Recognition (ADR), and Driver Readiness Monitoring for Automated Driving (DRMAD)	M1, M2, M3, N1, N2, N3
EDR	Event Data Recorder	M1, M2, M3, N1, N2, N3
ELK	Emergency Lane Keeping	M1, N1
FFW	Frontal Full-Width Impact	M1, N1
HED	Pedestrian and Cyclist Enlarged Head Impact Zone	M1, N1
ISA	Intelligent Speed Assistance	M1, M2, M3, N1, N2, N3
REV	Reversing Safety	M1, M2, M3, N1, N2, N3
TPM	Tyre Pressure Monitoring (heavy duty)	M2, M3, N2, N3, O3, O4
VIS	Direct Vision & Pedestrian and Cyclist detection (heavy duty)	M2, M3, N2, N3
ALC	Alcohol interlock installation document	M1, M2, M3, N1, N2, N3
ESS	Emergency stop signal	M1, M2, M3, N1, N2, N3
PSI	Pole side impact occupant protection	M1, N1

# How vehicle technology enhances safety

## Vehicle technology that scales is either wanted and/or regulated

### Intelligent Speed Assistance (ISA)



### Road safety: EU plans vehicle speed limiters from 2022

2 hours ago

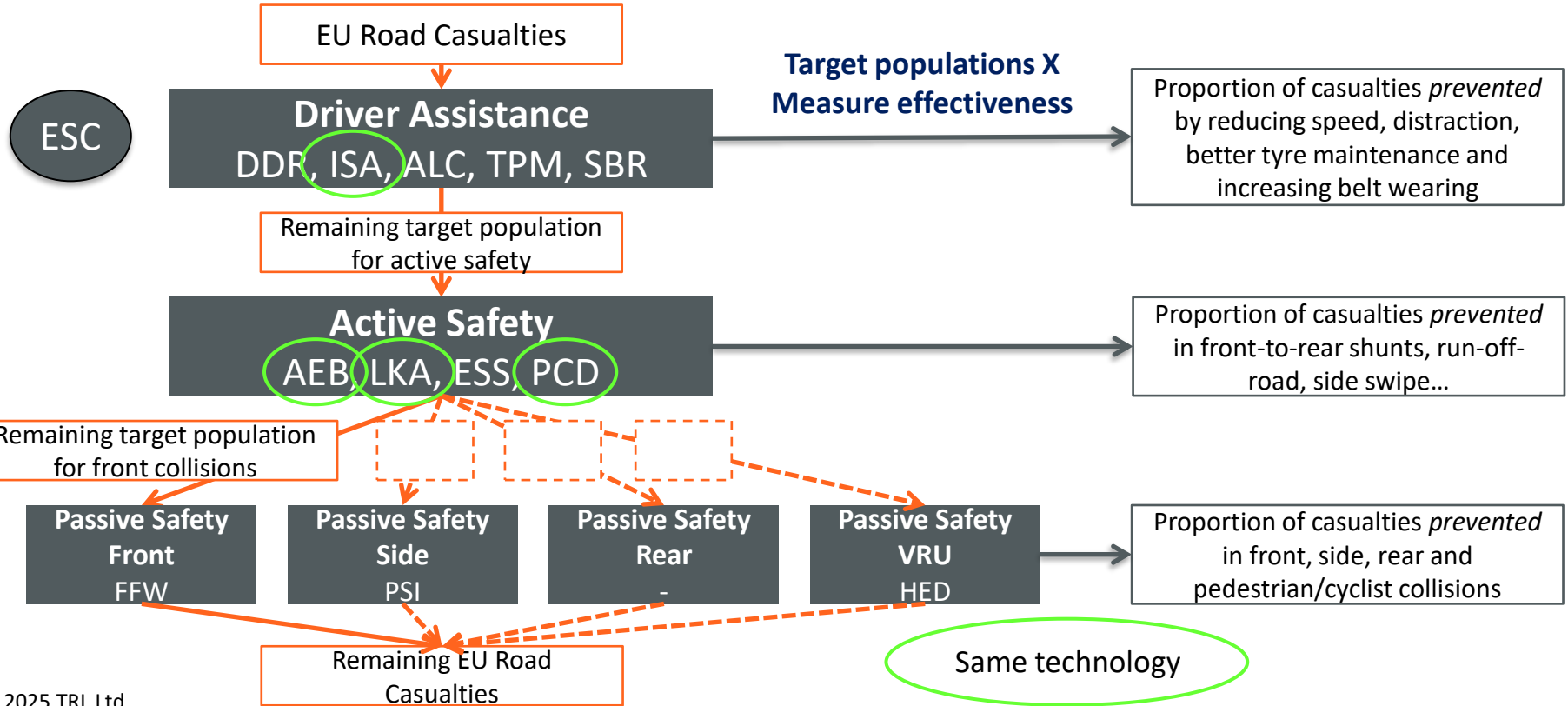
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# How vehicle technology enhances safety

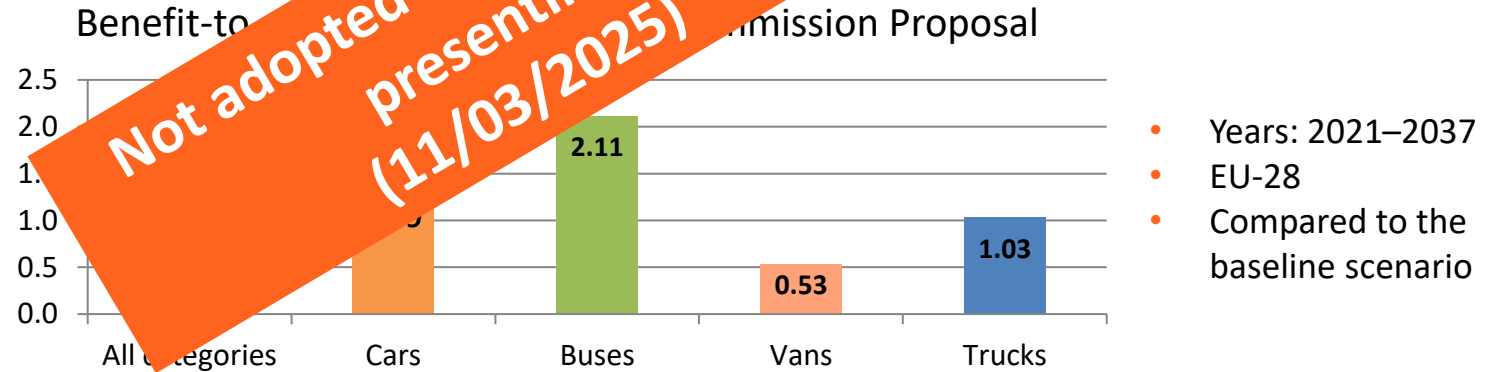
GSR & PSR: TRL 'vehicle safe system' approach for preventing casualties (example for cars)



# How vehicle technology enhances safety

## Casualty savings & cost-effectiveness evaluation of revisions to GSR & PSR

- Savings of **700,000 casualties** (25,000 fatalities, 141,000 serious casualties prevented)
- Cost-effective – **Benefits to society exceed the costs**
- The **GSR proposal is technologically advanced** and **EU Industry to remain competitive** with regard to the **challenges of development**



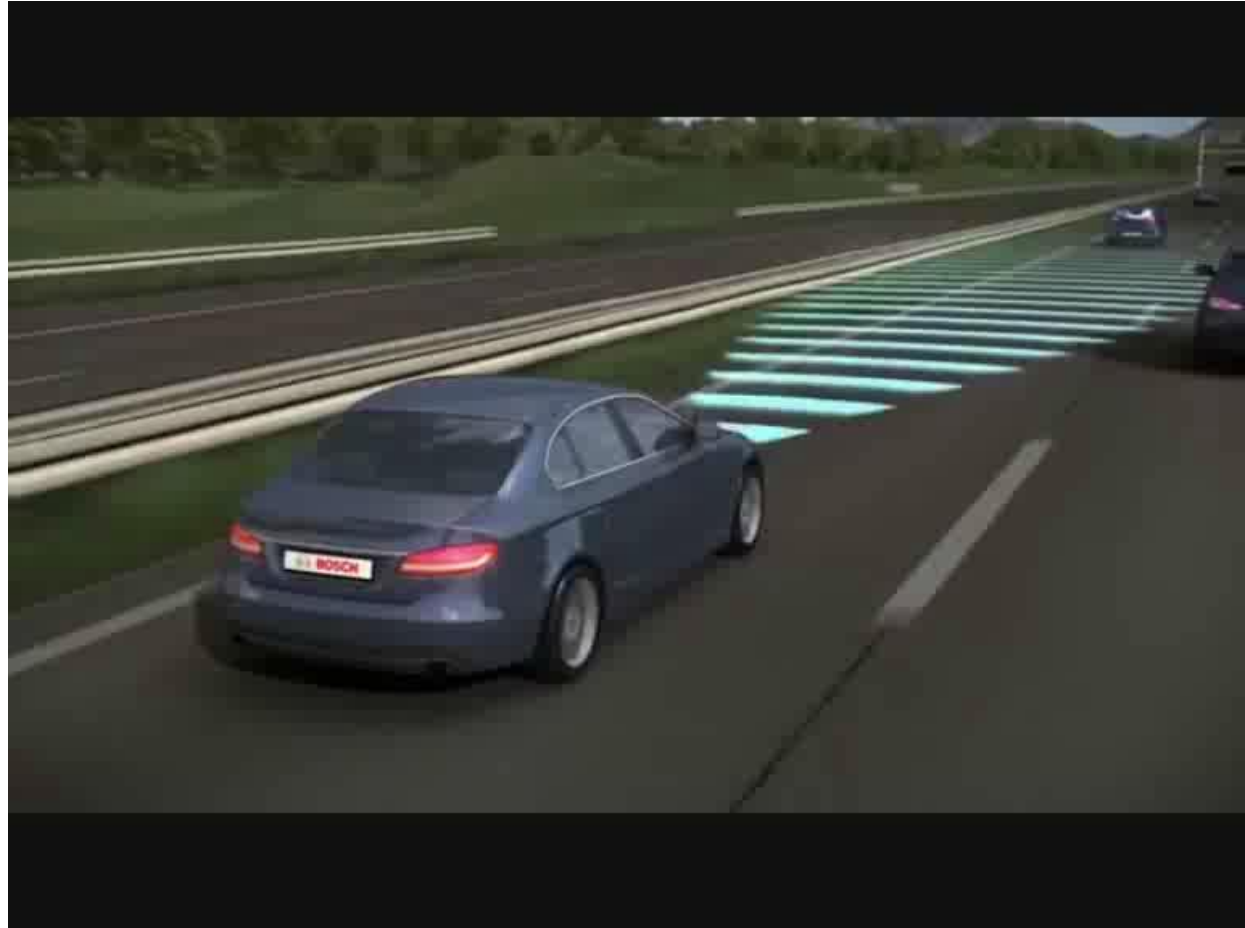
Values greater than 1 indicate that the benefits are greater than the costs

# How vehicle technology enhances safety

**2014:**

Adaptive Cruise  
Control with lane  
keeping

Not regulated



# How vehicle technology enhances safety

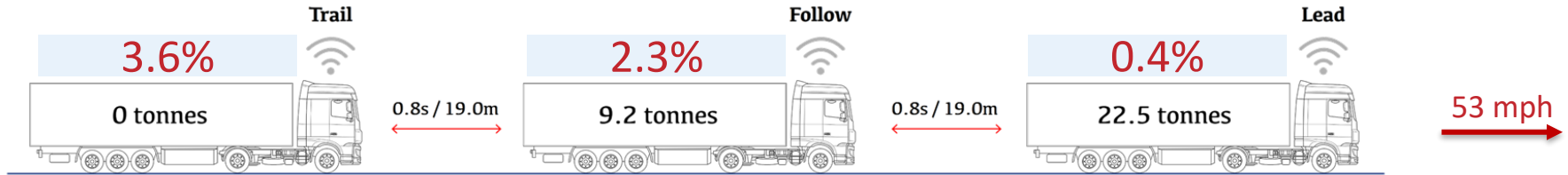


## Transport System Thinking

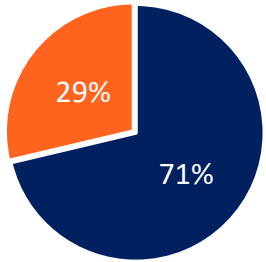
How can we reduce harmful emissions and prevent casualties?

# How vehicle technology enhances safety

## Fuel savings and emissions – Optimised network: **2.5%**



Compared with ACC time gap: 1.6s (radar)



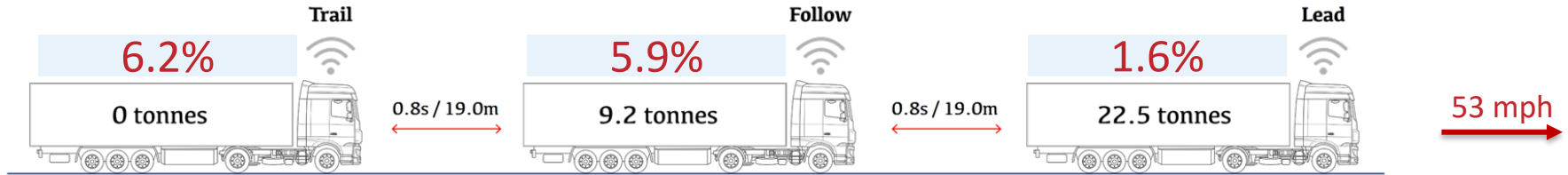
■ Platoon ■ Non-platoon

Proportion platooning



# How vehicle technology enhances safety

## Fuel savings and emissions – Constant platooning: 4.1%



Compared with ACC time gap: 1.6s (radar)

### Platooning is safe

- *Surrogate Safety Measures* taken from vehicle data showed that platooning mode was safer
- No increased risk to other road users or disruption to traffic flow at 'platoonaible' junctions
- Platooning had no substantial impact on driver workload
- Platooning is not expected to introduce new collision types
- Predicted beneficial effect on common HGV collision types



# How vehicle technology enhances safety

## Vehicle occupant casualties

- There is good evidence that safety technology is effective
- There is scope for technology to prevent more
  - Collisions
  - Injuries in the event of a collision

## Pedestrian, cyclist and other road users

- There is limited evidence that safety technology is effective
  - Collision prevention evidence +ve
  - Injury prevention evidence ?
- There is significantly more that can be achieved, and this must be part of a **Safe System** approach
  - Vehicle design
  - Speed limits
  - And more ...



**RESEARCH FOR TRAN  
COMMITTEE - THE IMPACT OF  
HIGHER OR LOWER WEIGHT AND  
VOLUME OF CARS ON ROAD  
SAFETY, PARTICULARLY FOR  
VULNERABLE USERS**

STUDY



# How vehicle technology enhances safety

- Vehicle technology **enhances** safety
- Practicable consideration is essential when planning for change, there is inertia ...
  - International automotive sector commercial models (\$Billions)
  - International vehicle regulations
  - Market demand – People are diverse, and a relatively small percentage buy new vehicles, and they are not always representative
- Communication between vehicles, road operators, service providers .. **V2X**
- **Prioritise Pedestrians & Cyclists**



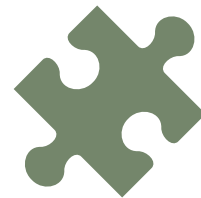
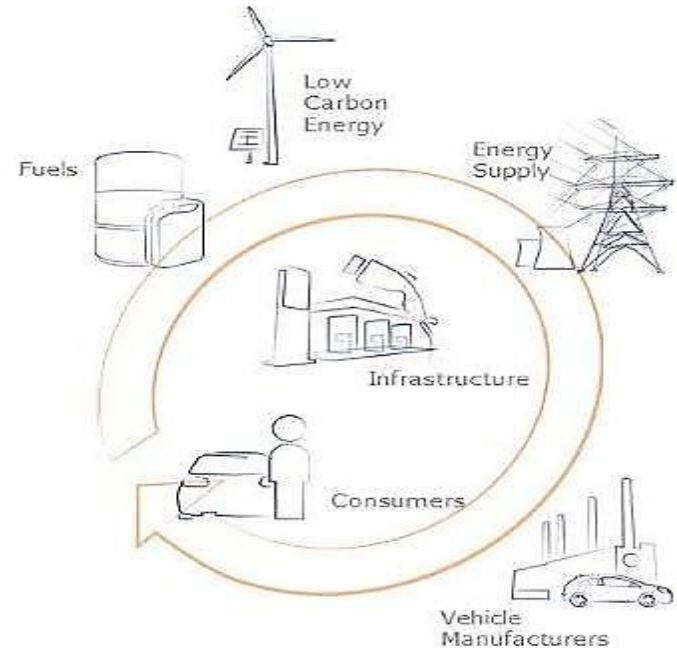
**Diversity in users and vehicles is growing**





# How vehicle technology enhances safety

- To maximise the societal and economic benefits of new vehicle technology requires the cooperation of **multiple stakeholders** and **future proof design**
- Design **Transport Systems** first and not engineer them around vehicle design – this way vehicle technology has a north star
- New vehicle technologies will play a big part in how our journeys change
- Don't underestimate the importance of **HMI** or the increased proportion of **larger vehicles** on our roads (SUVs and light commercial)



**Transport Systems are complex**  
– Early engagement with stakeholders to shape the constituent parts



# Shaping the Future: How vehicle technology enhances safety

Prof. Richard Cuerden