



UNIVERSITY OF
BIRMINGHAM

Unlocking future freight transport capability through novel moving model vehicle aerodynamics research

Dr David Soper



Introduction



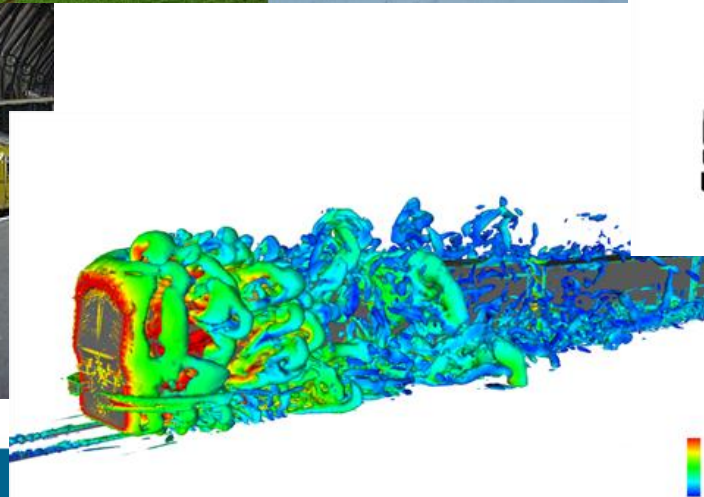
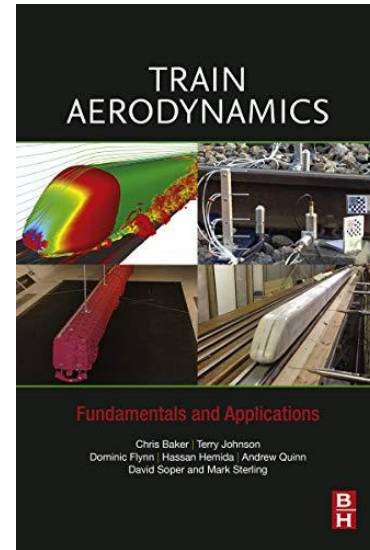
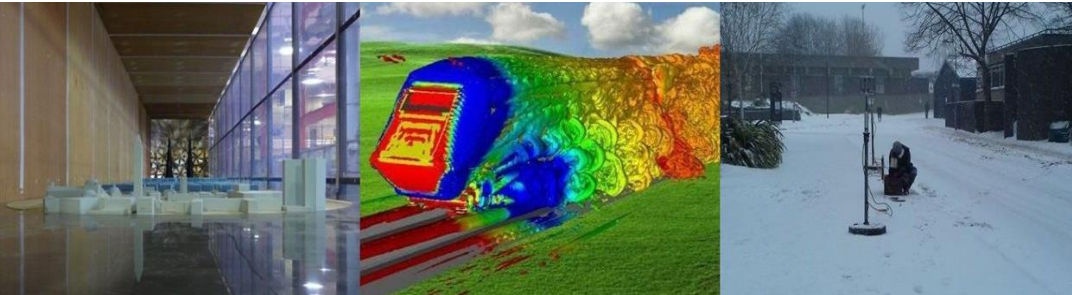
We are researching solutions to these issues from an aerodynamic perspective in key areas:

- The need to reduce energy consumption within the sector
- Understand and reduce vehicle aerodynamic drag

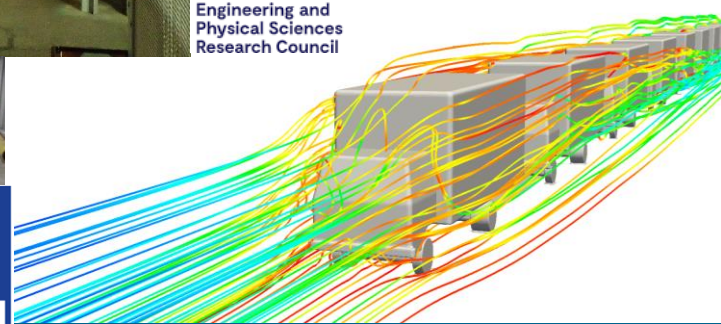


Wind Engineering and Vehicle Aerodynamics at Birmingham

- ❑ The wind engineering and vehicle aerodynamics research group has expertise in full- and model-scale experimental testing, as well as computational simulations.
- ❑ The ability to use all these techniques, within the right context, sets our group apart from others internationally.



Vehicle aerodynamics at Birmingham



TRAIN rig
University of Birmingham



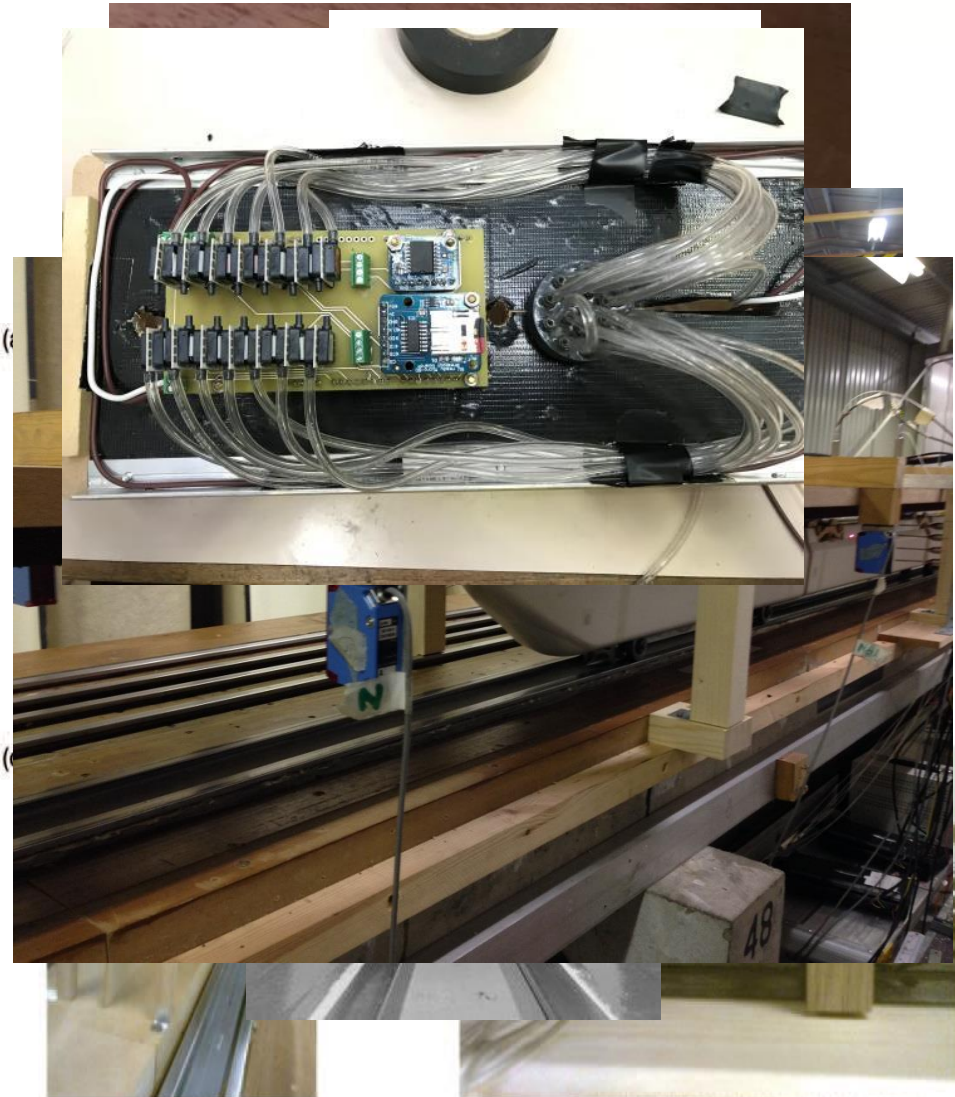
TRAIN Rig

Transient Aerodynamic Investigations

University of Birmingham

What do we actually research there?

- ❑ Slipstream velocity measurements
- ❑ Static pressure pulse measurements
- ❑ Pressures acting on the vehicle
- ❑ The effects of crosswinds at various yaw angles
- ❑ Aerodynamic pressures acting on road/trackside structures
- ❑ Aerodynamic effects of a vehicles passing through a tunnel
- ❑ The effects of topography/embankments
- ❑ Pollutant dispersion
- ❑ Aerodynamic loads affecting ballast flight



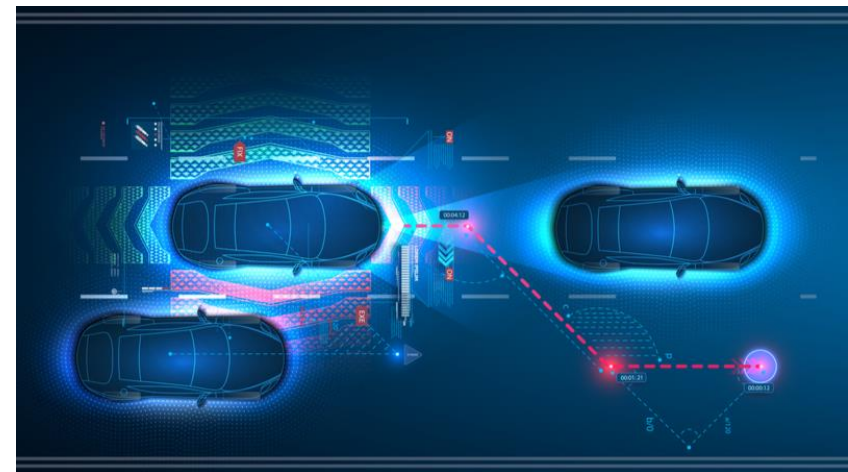
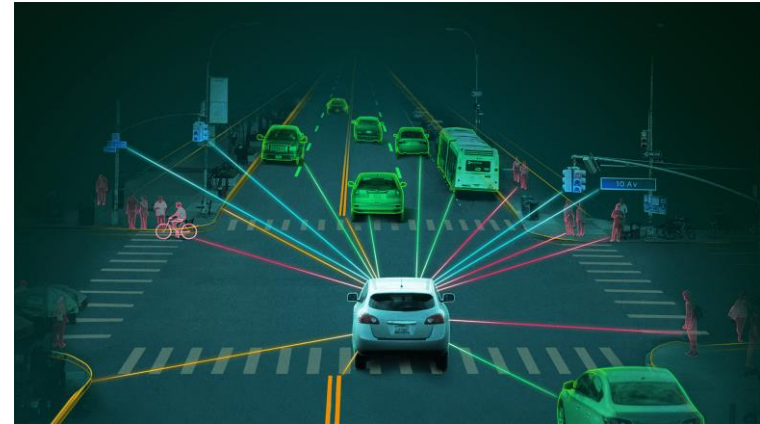
Canopy

Trestle platform (from side of track)

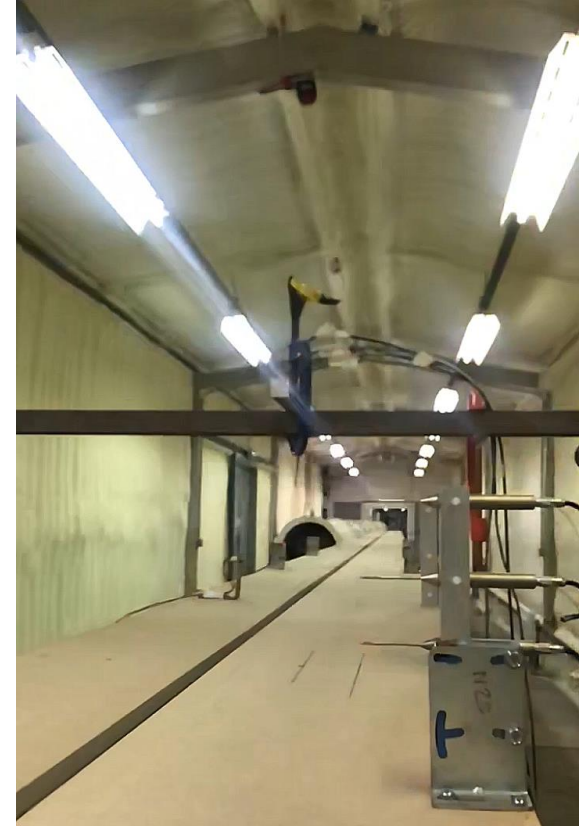


Close-proximity autonomous HGVs

- The introduction of autonomous vehicles has potential economic benefits likely to reach values of £1.5 trillion by 2025.
- Government looking to introduce autonomous vehicle technologies which lends itself to vehicles travelling in very close proximities.
- This lends itself to adopting 'platooning' methods for these vehicles.
- It is likely that haulage firms will be the first users to adopt autonomous methods.



Close-proximity autonomous HGVs

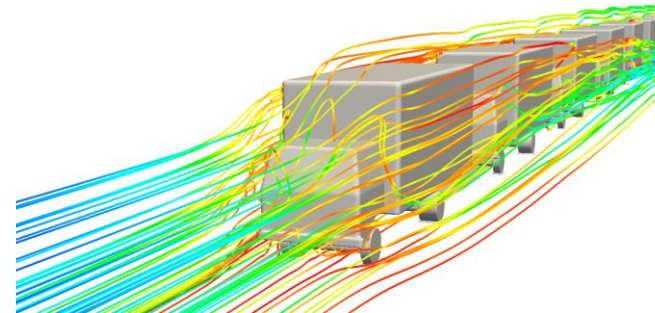
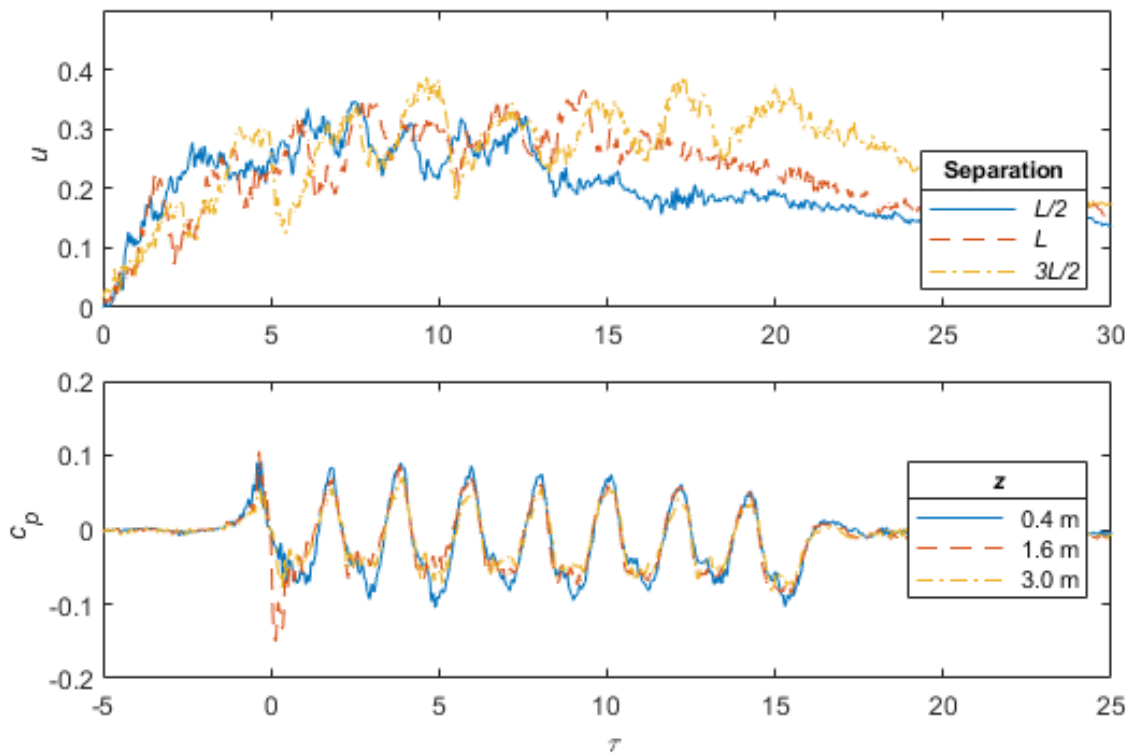


Close-proximity autonomous HGVs

Findings indicate highly turbulent aerodynamic flow:

- Implications for other road users and roadside workers
- What happens when vehicles enter into manoeuvres/overtakes?
- Lateral forces on vehicles to be considered in autonomous systems

This research is vital to the safe introduction CAV technologies through enabling a proper aerodynamic assessment at the design phase, leading to the development of policies, standards, and safe working practices.

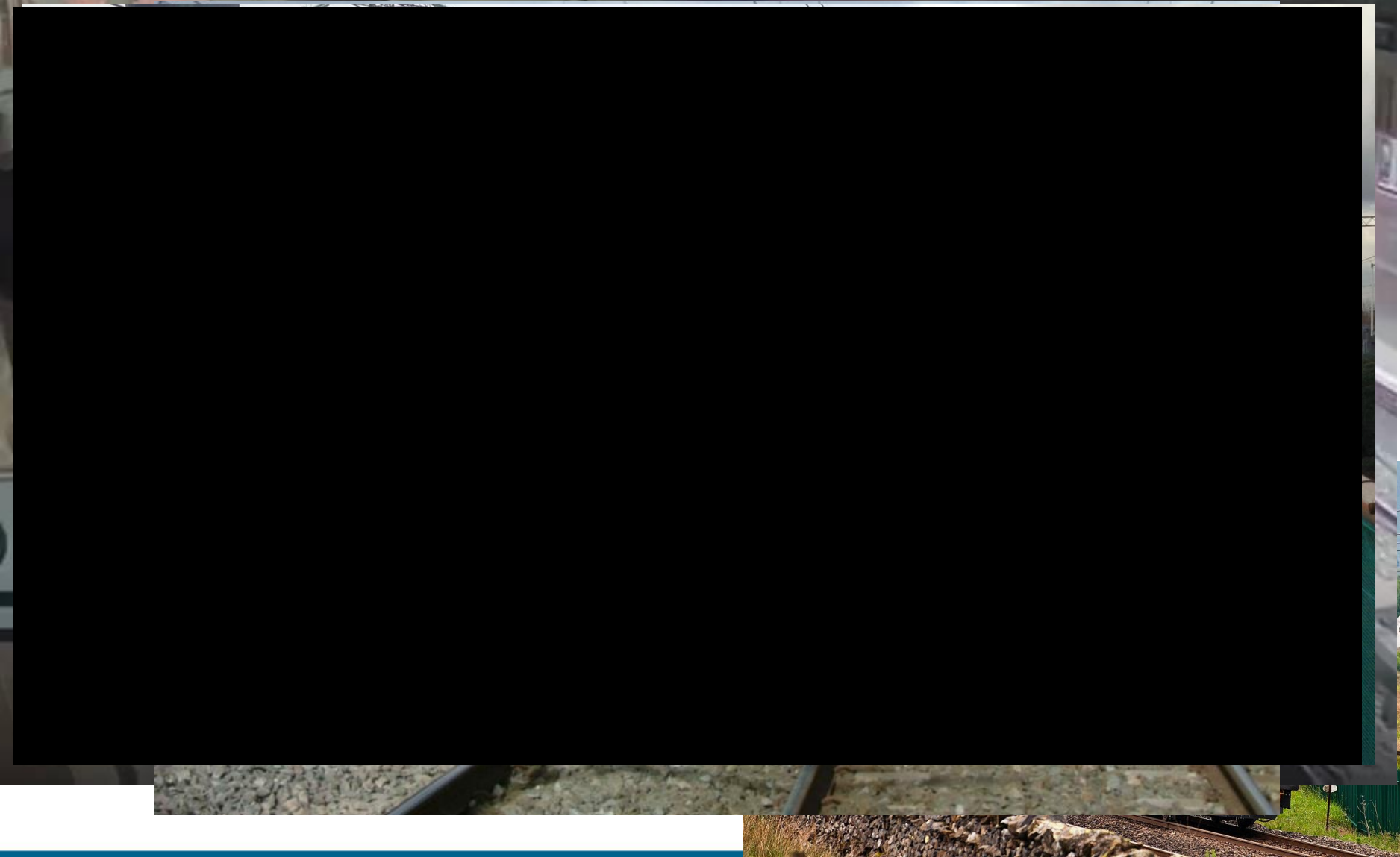


‘Superfast Freight’: aerodynamic assessments and mitigations



**RAIL
SAFETY AND
STANDARDS
BOARD**

Superfast rail freight



Future opportunities

Safety

- Complex vehicle/infrastructure interaction
- Platform and roadside safety
- Wind risk mapping

Decarbonisation and fuel consumption

- Vehicle design
- Railway timetabling
- Aerodynamic optimisation

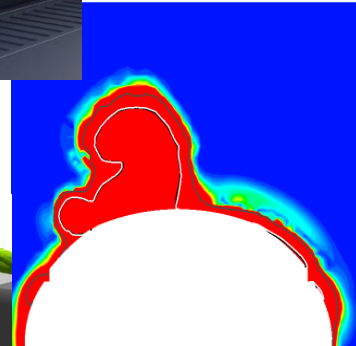
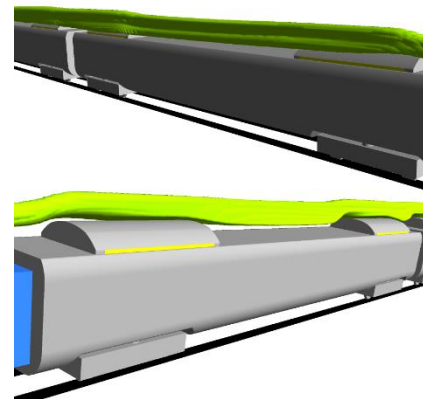
Pollution dispersion

Onboard vehicle air quality

Road and rail grand challenges

- Efficient and fast freight
- Introduction of Smart and Autonomous vehicles
- Emerging transport modes

Ready to meet emerging needs of the transport sector and industry



QUESTIONS?

Thank you for listening

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