

# Opportunities and barriers for truck platooning in Norway

Maren Eitrheim, Markus Log,  
Trude Tørset, Tomas Levin, Kelly Pitera





# Introduction

- Background in cognitive psychology and human factors
- Worked at IFE Halden since 2007
  - Control room research, simulator-based studies, multi-unit operation
- Started my PhD in March 2020 (75% over 4 years)
  - Digitalization and automated road transport
  - Funded by Norw. Public Road Adm. (NPRA)
  - Working closely together with Markus Log (PhD candidate)
  - Main supervisor: Trude Tørset (NTNU)
  - Co-supervisors: Tomas Levin (NPRA), Trond Nordfjærn (NTNU)

- Motivation and terminology
- Research objectives
- Stakeholder interview study
- Conclusion
- Q&A















1. **Identify opportunities and barriers for platooning in Norway**
2. Investigate how platooning affects driver workload, and regulatory implications
3. Investigate how real-world experience affects trust and acceptance of platooning
4. Assess infrastructure readiness for platooning on two-lane, two-way roads
5. Evaluate the applicability of multi-disciplinary research methods in real-world testing
6. Recommend future research and actions

## Acceptability

- Predicting intentions to use a tool prior to exposure
- Prospective judgements among stakeholders prior to introduction (no experience)

## Acceptance

- Evaluation while using the tool
- Individual acceptance among drivers in terms of actual use in an on-road pilot test




### Study 1

Opportunities and barriers for truck platooning on Norwegian Rural Freight Routes

### Study 2

Driver experience of partly automated truck platooning in Northern Norway

# Opportunities and Barriers for Truck Platooning on Norwegian Rural Freight Routes

Maren Helene Rø Eitrheim<sup>1,2</sup> , Markus Metallinos Log<sup>1</sup> ,  
Trude Tørset<sup>1</sup>, Tomas Levin<sup>3</sup>, and Kelly Pitera<sup>1</sup> 

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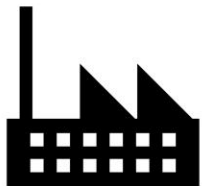
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# WHO ARE THE STAKEHOLDERS?



## Shippers

Goods producers



## Local inhabitants

Indirect involvement as property owners and workers



## Receivers

Order and receive goods



## Other road users

Cooperate with platoons



## Carriers

Collect and deliver goods



## Road owners

Build, operate and maintain national, county, and municipal roads



## Original Equipment Manufacturers (OEMs)

Technology development



## Authorities and policymakers

Responsible for transport infrastructure, laws and regulations

- 21 participants
- Semi-structured interviews via Teams
- Case examples
- Thematic analysis in NVivo



## Opportunities, barriers, deployment, and research needs

1. Understanding of truck platooning
2. Impacts on truck drivers
3. Societal impacts and public acceptance
4. Logistics
5. Economy
6. Infrastructure readiness



What is truck platooning?



### Opportunities

- Safe and economic driving
- Improved workload management by rotating lead and following positions
- Designated leaders on challenging routes
- Enable nondriving tasks or rest while moving
- Enable drivers to return home at night



### Barriers

- New work processes for trip planning and coordination, maneuvers to join and leave platoons
- Added demands for driver monitoring of platoon system and boundary conditions
- Leadership responsibilities for driver in the first truck
- Diverging preferences between lead and following drivers
- Reduced independence and freedom for drivers

## Opportunities

- Optimize handling of present freight volumes
- Ensure reliability of supply
- Improve safety and accessibility for other road users
- Prevent speeding and risky driving

## Barriers

- Changes in perceived control for shippers and receivers
- May be perceived as a threat against political objectives for goods transfer from road to rail and sea
- Concerns about overtaking and willingness for other road users to cooperate with truck platoons








# It's a Match!

You and SCS 857 have liked each other.



 Send a Message

 No, thanks

 Tell your friends

### Opportunities

- Complement directional freight balance
- Simplify logistics planning
- Regulate and sanction unfair behavior

### Barriers

- Truck volumes
- Carrier cooperation
- New scheduling demands
- Waiting times
- Cargo security
- Data sharing and cyber security

### Deployment ideas

- Matchmaking system to organize platoons across carriers
- Target cargo that has high volumes and/or regularity
- Target origin–destination pairs with high road freight volumes
- Target ferry-dependent areas
- Utilize infrastructure at low intensity time windows

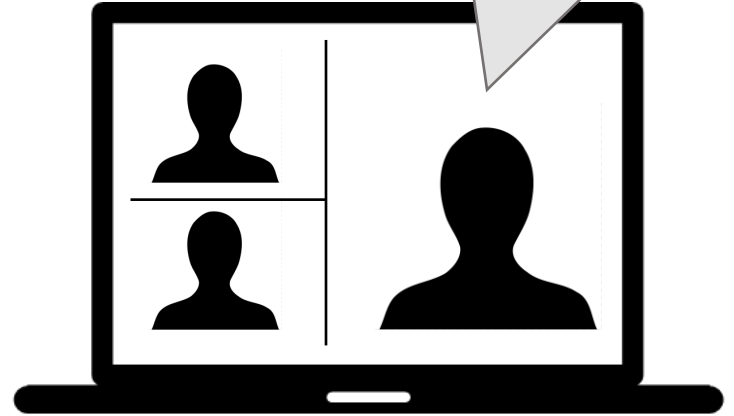
### Opportunities

- Reduced transport times and labor costs
- Fuel savings
- Improved utilization of driving, working, and rest periods

### Barriers

- Start-up costs
- Potentially limited fuel savings compared with other measures
- Inadequate labor savings if drivers are needed in all trucks
- Waiting time costs
- Contrary views about being platoon leader

*“The same company may not want to drive first all the time. At least not the business owner, because doing so is more costly. While the driver may want to drive first.”*



### Opportunities

- Address current road shortcomings for all users
- Improved road capacity
- Enable highly automated driving
- Reduce interaction with other road users

### Barriers

- Lack of uniform, high quality road infrastructure
- Narrow, steep, and winding roads and tunnels
- Lack of truck stops for platoon coordination
- Winter conditions





- Fuel savings not enough, what about transit times and driver costs?
- Will drivers and other road users find platooning favorable, safe and easy to use or cooperate with?
  - Overtaking – does platooning require multilane roads?
- Clarify demands for platoon drivers to monitor and intervene in challenging road and weather conditions
  - Regulatory implications
- A matchmaking system for low-volume areas
- Re-evaluation of road parameters and infrastructure management
  - Requirements for sight distances, climbing lanes, traffic separation...
- Real-world testing on two-lane roads
  - Road standards, operational demands, impacts on other road users, freight volumes and organizational ease





# EXTRA: ON-ROAD PILOT STUDY 2020



## IDENTIFY FUTURE RESEARCH NEEDS

- What can we learn from real-world testing?



## ASSESS INFRASTRUCTURE READINESS

- Are the roads good enough?



## INFORM FUTURE REGULATIONS

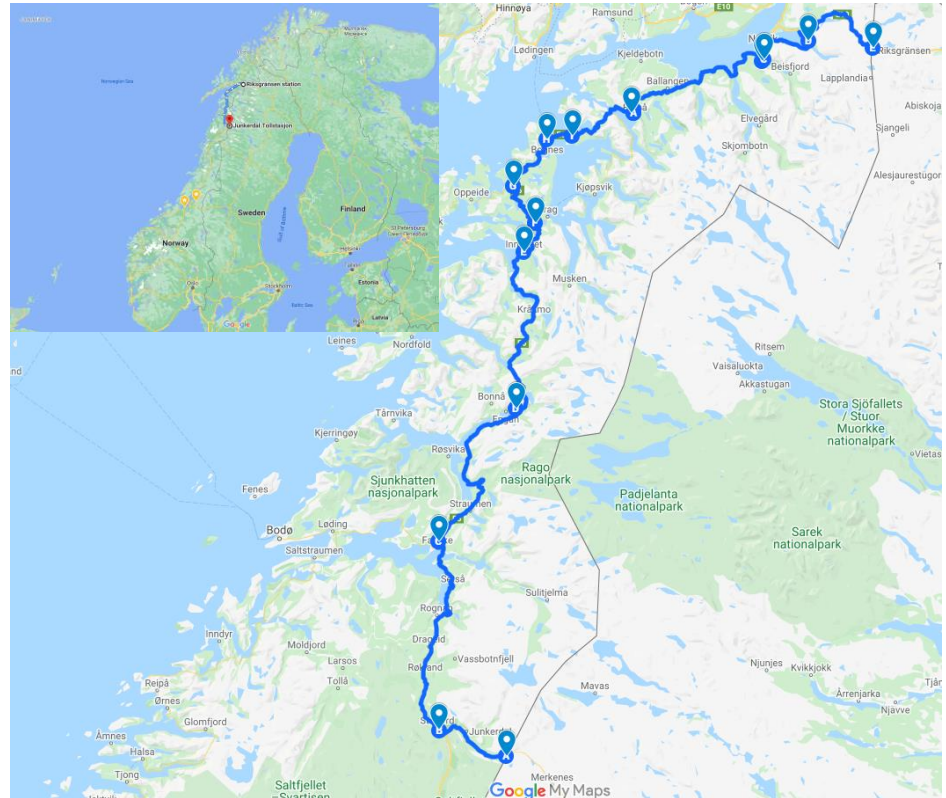
- Impacts on truck drivers and other road users

## 380 KM PREDEFINED ROUTE

- High-quality road sections, and sections with challenging features

## 3 TRUCKS AND 3 DRIVERS

- Connected through a convoy system based on radar and camera
- First truck controlled speed and distance between the trucks
- Drivers performed steering manually



<https://www.youtube.com/watch?v=DtBbjHxi7-M>

