



Norwegian Tunnel Safety Cluster, Certification & Centre

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Norwegian Tunnel Safety Cluster:

- Founded in 2016
- Incorporated into the national cluster programme in June 2016
- 119 participants:
 - Companies: **101**
 - R&D/academic and innovation centres: **8**
 - Public sector organisations, including the emergency services: **10**

Participants

- Total: 121
- Companies: 102
- R&D: 8
- Public: 11

Supporters:



ROGALAND FYLKESKOMMUNE



STAVANGER KOMMUNE



Our Vision

- *Be a leading global player within tunnel safety by 2025.*



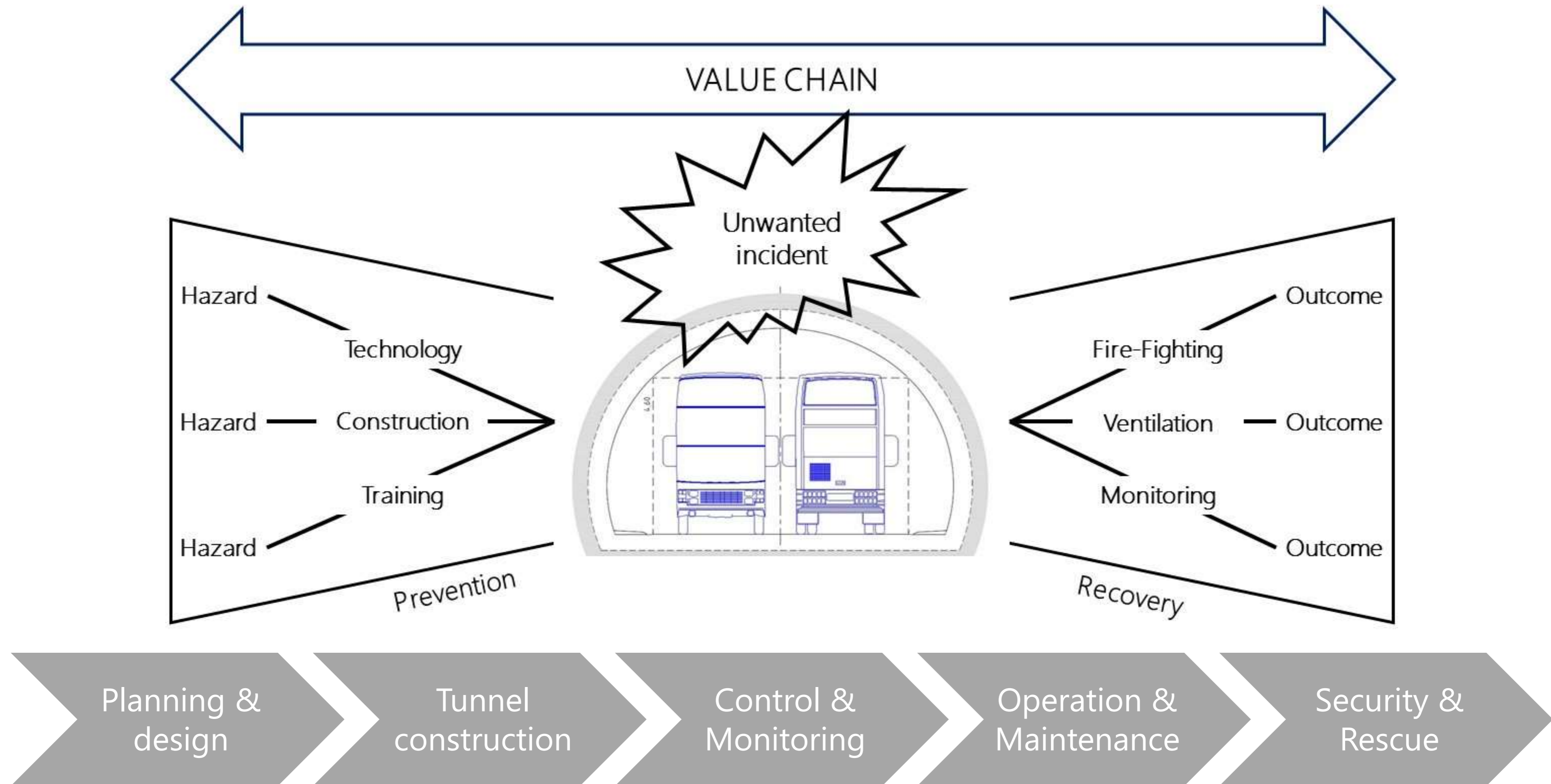
Our Mission

Develop a innovative cluster where members succeed in commercialising solutions for improved tunnel safety.

This will contribute towards safer tunnels and fewer accidents – vital to road users, the fire and rescue services, the transport sector and local communities everywhere.



The clusters core business:



Main activities

Norwegian Tunnel Safety Cluster

Internationali-
zation

Entrepr
eneur-
ship

Standa
rdi-
zation

Digitali
zation

Sustain
ability

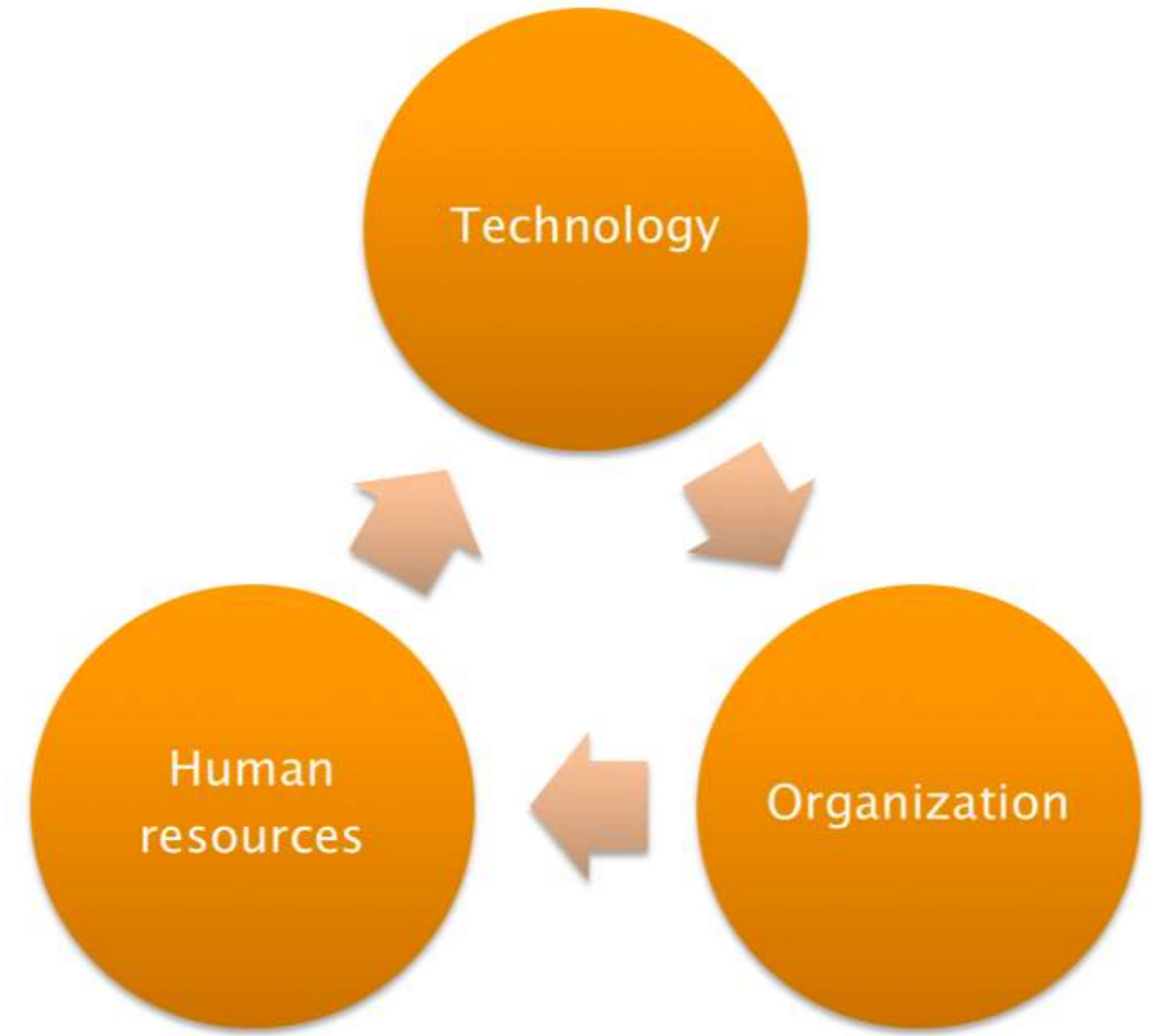
Facilities for research, development,
demonstration & learning

Norwegian Tunnel Safety Standardization Project



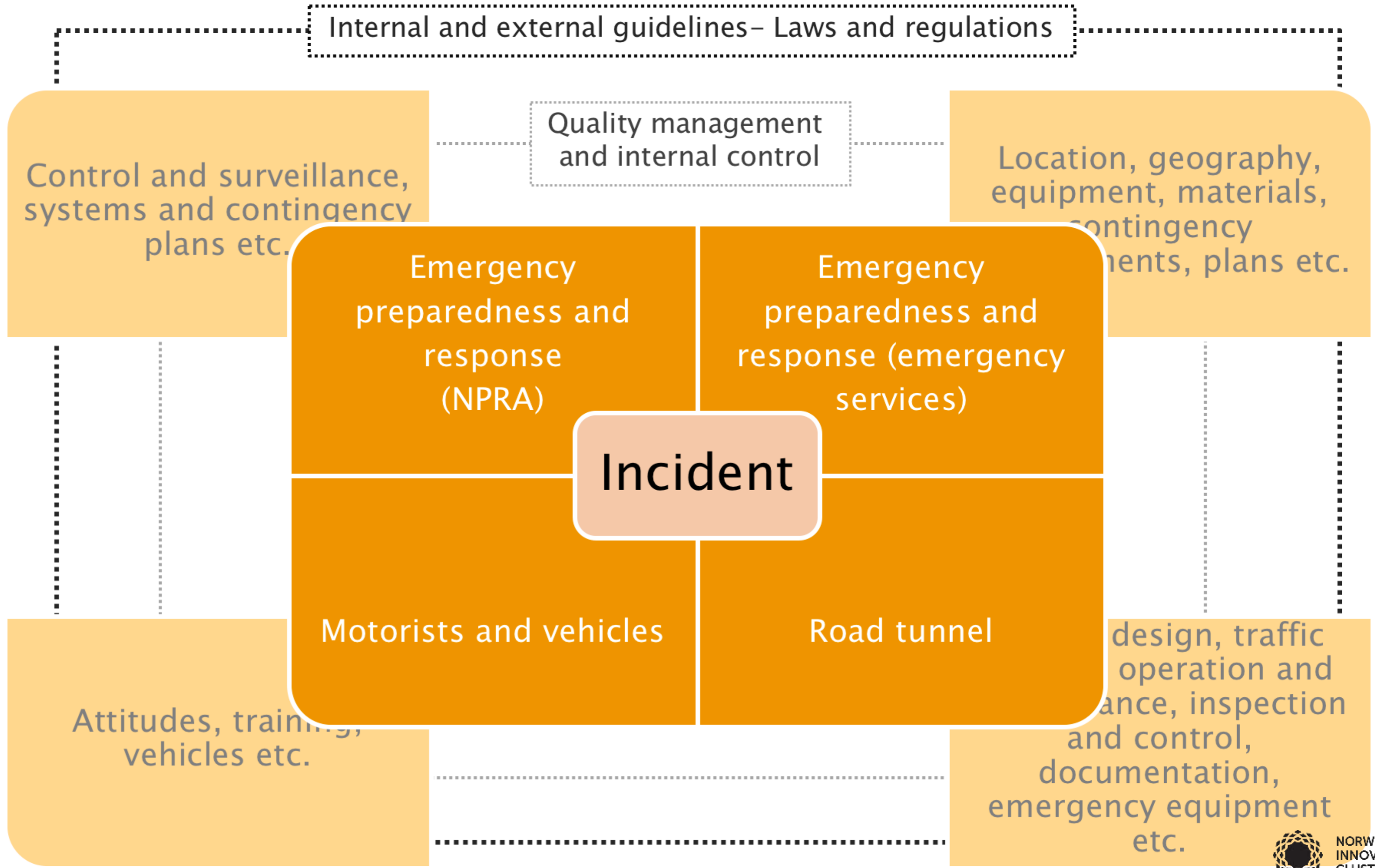
What influences the outcome of an incident?

It's a complex picture



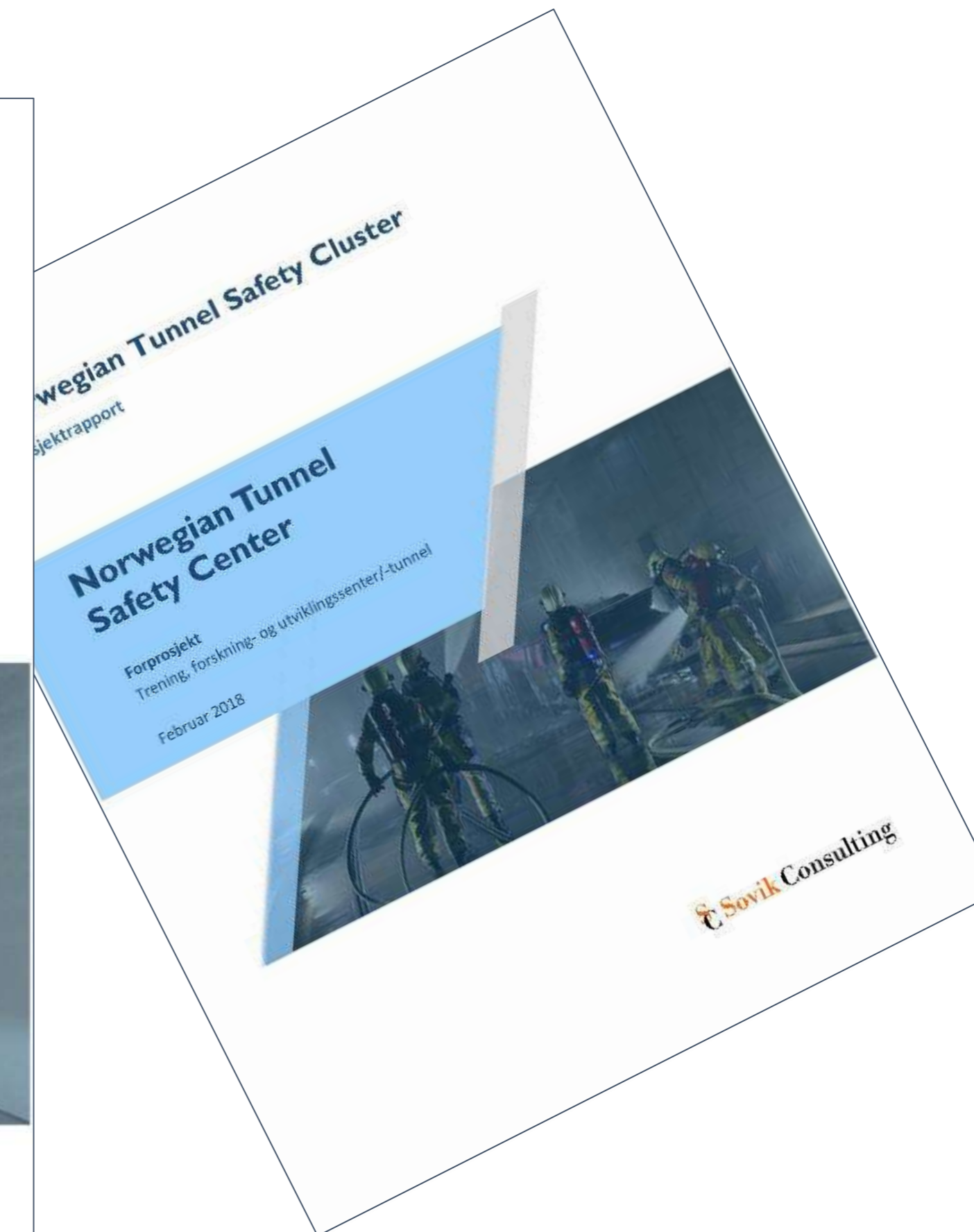
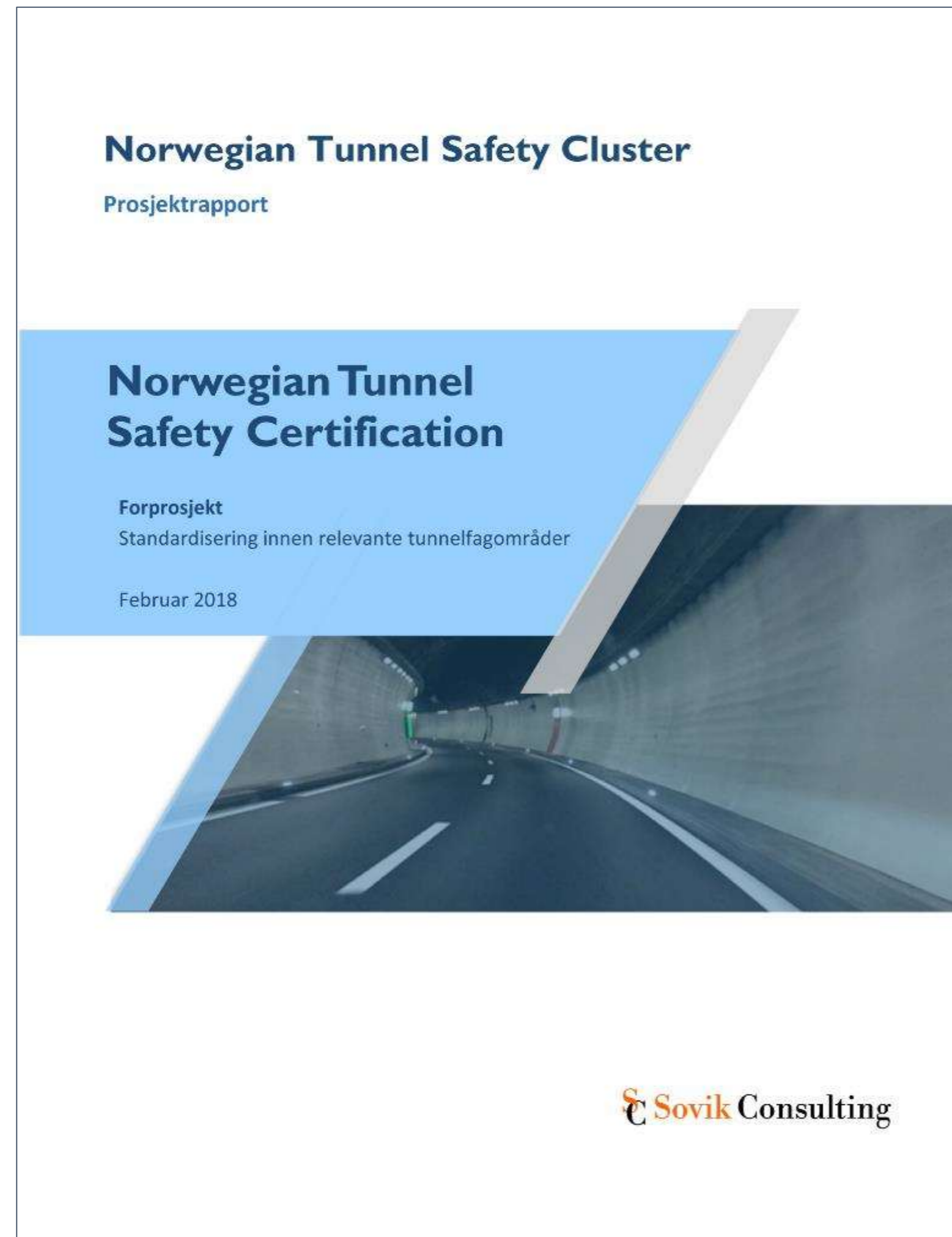
Commissioning and safety approval

Are the regulations, our processes and the documentation sufficient?



Development projects

Norwegian Tunnel Safety Cluster Projects



Standardisation

Norwegian Tunnel Safety Cluster



***Standardisation** is the process of implementing and developing technical standards based on a collaboration between organisations and companies including road/rail authorities, consultants, contractors, suppliers, and manufacturers, but also users and other national and international stakeholders are an important part of the collaboration.*

*In general, standardisation **lead to better compatibility, interoperability, safety, repeatability and quality.***

Standardisation facilitate innovation because it provides structured methods that makes it easier to disseminate ideas and knowledge about leading technologies and best practices.



Why standardisation?

Challenges and **best practice**

Tunnel construction and installations have often major weaknesses that affect reliability, availability, maintainability and safety of tunnels.

Tunnels with weaknesses largely affect costs, lifespan of construction and installations, and in many cases give high socio-economic costs in terms of more frequent shutdowns and less available road network. In addition, weaknesses could significantly affect safety.

It is important to apply new research, best practices, new technologies and new experiences, and Norwegian Tunnel Safety Cluster will facilitate research, development and improve how we build and operate tunnels, and most important of all share results in innovative ways.

1

Reliability

Construction, infrastructure, installations and equipment have an important role in safety, and we are dependent on reliability.

2

Availability

Weaknesses in construction, infrastructure, installations and equipment lead to closures, social economic costs and unnecessary costs in operation.

3

Maintainability

To ensure functionality over time, the solutions need to be designed in such a way that operation and maintenance can be carried out in a cost effective way.

4

Safety

Safety is effected of weaknesses in konstruktion and installations.

Norwegian Tunnel Safety Certification

Norwegian Tunnel Safety Standard project focus on development, improvement and standardization of methods and technologies that have an impact on road tunnel operations and safety.

The aim of the project is to develop an innovative and sustainable network for the improvement and development of standards and/or guidelines, and through this work contribute to improve tunnel safety nationally and internationally.

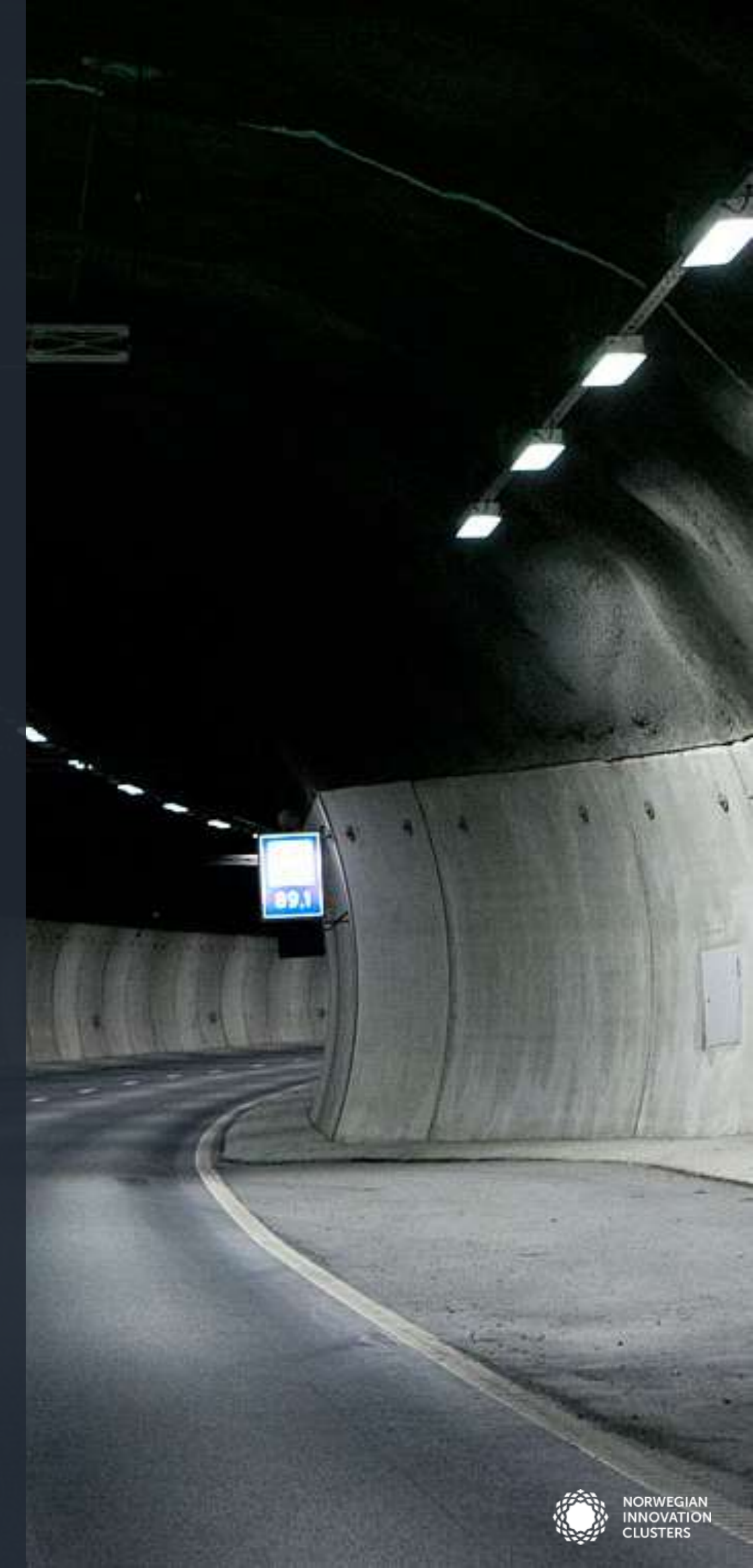
The NTSC will organize several resource groups with participants from all across the the industry, including participants from the authorities and other national and international stakeholders and organisations.

Tunnelstandard

Relevante fag **områder**

The resource groups will seek best practice, develop standards/guidelines, perform Reliability, Availability, Maintainability and Safety (RAMS) assessments and Health, Environment and Safety (HES) assessments of the standards/guidelines.

Further on the standards/guidelines will be subject of consultation, revisions and finally approved and implemented at authorities, organisations and in regulations.



Planning, assessment & execution

Committees With in planning-, assessments and execution

Resource groups

Planning, analysis and execution (4 groups)



RG1: Assessments in planning, design and construction

Planning, analysis and execution

Reliability, Availability, Maintenance and Safety are ensured through assessments of RAMS, LCC, Risk and Emergency, and assessments must be ensured through well designed standardised methods and processes.

G+



RG2: Tunnel management and preparedness planning

Planning, analysis and execution

Owner's responsibilities and other stakeholders' responsibilities and interests must be safeguarded through well-defined and standardised routines, procedures, training, exercises and use of technology.

G+



RG3: Operation and maintenance

Planning, analysis and execution

Operation and maintenance of tunnels must be safeguarded through well-defined and standardised routines, procedures and use of technologies. Important to ensure reliability and functionality of important safety equipment.

G+



RG4: BIM Standard and digital collaboration

Planning, analysis and execution

Ensuring that BIM standard for tunnel construction, installations and equipment are implemented in accordance with best practices and standards.

G+

Construction & installations

Committees with in construction- and installations



RG5: Construction elements

Construction and installations

Water and frost protection, barriers, road, side area, evacuation routes, evacuation shelters, drainage, pumps and basins.

G+



RG6: Electrical infrastructure

Construction and installations

Electrical infrastructure, emergency networks, radio coverage, mobile coverage and commercial networks.

G+



RG7: Control, Monitoring and ITS

Construction and installations

Control and monitoring systems and Intelligent Transport Systems (ITS).

G+



RG8: Ventilation

Construction and installations

Operating ventilation, fire ventilation, fans and ventilation towers.

G+



RG9: Lighting, signs and markings

Construction and installations

Tunnel lights, emergency lights, signs, markings, lead lines and moving barriers.

G+



RG10: Safety Equipment

Construction and installations

Camera surveillance, sensors / detectors, active fire protection, emergency cabinets, emergency telephones and voice notification.

G+

Ve will work in teams

Høy nytteverdi og læring for **alle deltakere**



1. Seek practices/technology/research

Seeking best practice, new knowledge and new technology nationally and internationally.



2. Develop standard

Create a preliminary specification of the standard, for assessments and further consultation with the industry.



3. Assessments of standard

Conduct assessment of reliability, availability, maintainability and infrastructure safety (RAMS), Life Cycle Cost (LCC) and risk assessments, in addition to Health, Environment and Safety (HSE) Assessments.



4. Consultation and adaptations

Consultation and adaptation process that includes national and international stakeholders in the industry, and authorities.



5. Complete the standard, 3D and BIM

Complete the standard, with necessary adjustments to 3D and BIM, and facilitate approval and presentation in the Norwegian Tunnel Safety Center and in Virtual Reality (VR tunnel).



6. Final approval and implementation

Approval and implementation by authorities, organizations, and other actors in the industry.



Success factors

Create **entusiasme**

FAKTOR 01



Collaboration in the industry!

Development based on knowledge and experience in the whole industry (from owners to manufacturers)

FAKTOR 02



Simplicity and quick results!

We focus on creating a team process that is effective, and we will respect the members time and resources.


FAKTOR 03



Development for your own good!

The members/companies get the opportunity to influence national and international development and improvement in their market.

OPTION 04



Building network!

Opportunity to increase network, and develop products and services through collaboration and activities.

GOALS

Clear goals that coincide with the goals of participating companies.




ARENAS

Create national and international meeting places that are of great value to participating companies.



RESULTS

Showing results in innovative ways through the use of NTSCenter, 3D models and online solutions.



Partnerperspective

Close cooperation with national and international partners and stakeholders

Committee

- 

ROAD AUTHORITIES
 Responsible for road regulations and monitoring of the national road network
- 

BANE NOR
 Responsible for railway regulations and infrastructure
- 

DIREKTORAT FOR SAMFUNNSIKKERHET OG BEREDSKAP
 Responsibility for national, regional and local safety and emergency preparedness, as well as electrical regulations
- 

FYLKESKOMMUNENE
 Responsibility for county road network
- 

NYE VEIER
 State owned private Road Manager – Construction of new road network in Norway.
- 

NATIONAL & INTERNATIONAL STAKEHOLDERS
 Members, partners, academic communities and interest organizations.



Recent fires

Several large tunnel fires in 2011, 2013, 2015, 2017

- **Oslofjord tunnel 2011 (25 self-rescued, 9 people rescued by fire fighters)**
- **Gudvanga tunnel 2013 (67 people caught in smoke for 2 hours)**
- **Skatestraum tunnel 2015 (2 minutes to evacuate!)**
- **Gudvanga tunnel 2015 (32 passengers evacuated in an empty van)**
- **Oslofjord tunnel 2017 (2 rescued in evacuation chambers)**

In 2011, 2013 and 2015 – We where not prepared for a fire incident





Tunnel safety

challenges

In recent years we have experienced major fires in Norwegian road tunnels. Fires that could quickly have been a disaster, with many killed.

Learning and subsequent work shows that it is crucial for the outcome of such events that procedures, methods, construction, technical infrastructure and safety equipment are in place and function as intended.

Tunnels, which have become an important, complex and vulnerable part of the infrastructure, have major weaknesses in terms of reliability, affordability, maintainability and safety.

These are challenges that can be improved through the development of standards for planning, construction and operation and management of tunnels.

1

Major challenges with safety!

Experiences from Norway and Europe show that a fire in a larger vehicle can develop into a disaster fire.

2

Weaknesses in the tunnels?

Experience shows that there is a great need to standardize both methods, procedures, construction elements, infrastructure and equipment in the tunnels.

3

Facilitating development and improvement?

Research and development must be facilitated and supported to provide reliable, accessible, maintenance-friendly and secure constructions and installations for our road users. Experience shows that there are major additional costs for both society and infrastructure due to poor quality.

Norwegian Tunnel Safety Center

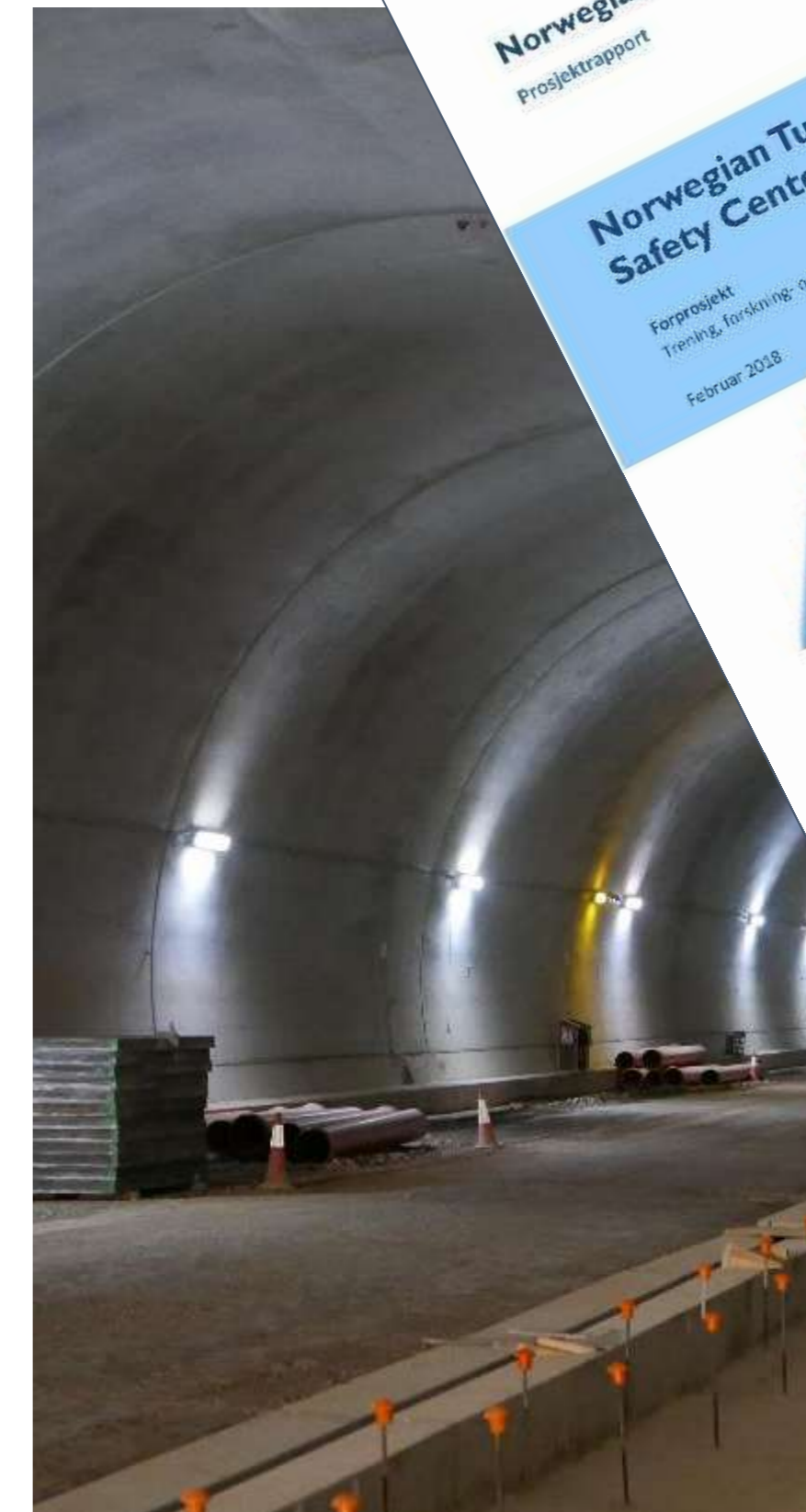
Norwegian Tunnel Safety Centre

We wish to establish the Norwegian Tunnel Safety Centre.

Facilitate learning, with the main focus on training of tactics and execution in practice, for firefighters. Furthermore, the facilities must be adapted for the training of the incident command.

Furthermore, the same tunnel facility are planned to have infrastructure and equipment designed for research and development, and be geographically and academically affiliated with universities and research environments, as well as a professional environment consisting of industry actors.

The facilities should have a function for research, development and testing, as well as demonstration of technology and solutions developed through industry cooperation in Norway.



The need for training

Best praksis in Europa

Incident command needs knowledge of tunnels and tunnel fires, as well as tactical dispositions.

- make the right decisions in a very demanding situation, both in terms of information access, tunnel complexity and risk.

Leading european authorities believe it is crucial for the outcome that the incident command has basic education and has knowledge of experience and best practices.

Firefighters perform tactically demanding work in a more or less unknown situation for them, compared to daily challenges.



The need for training

Best praksis in Europa

It is crucial for the outcome that firefighters have basic training in tactical methods for collecting information, search and rescue, and fighting fire in tunnels.

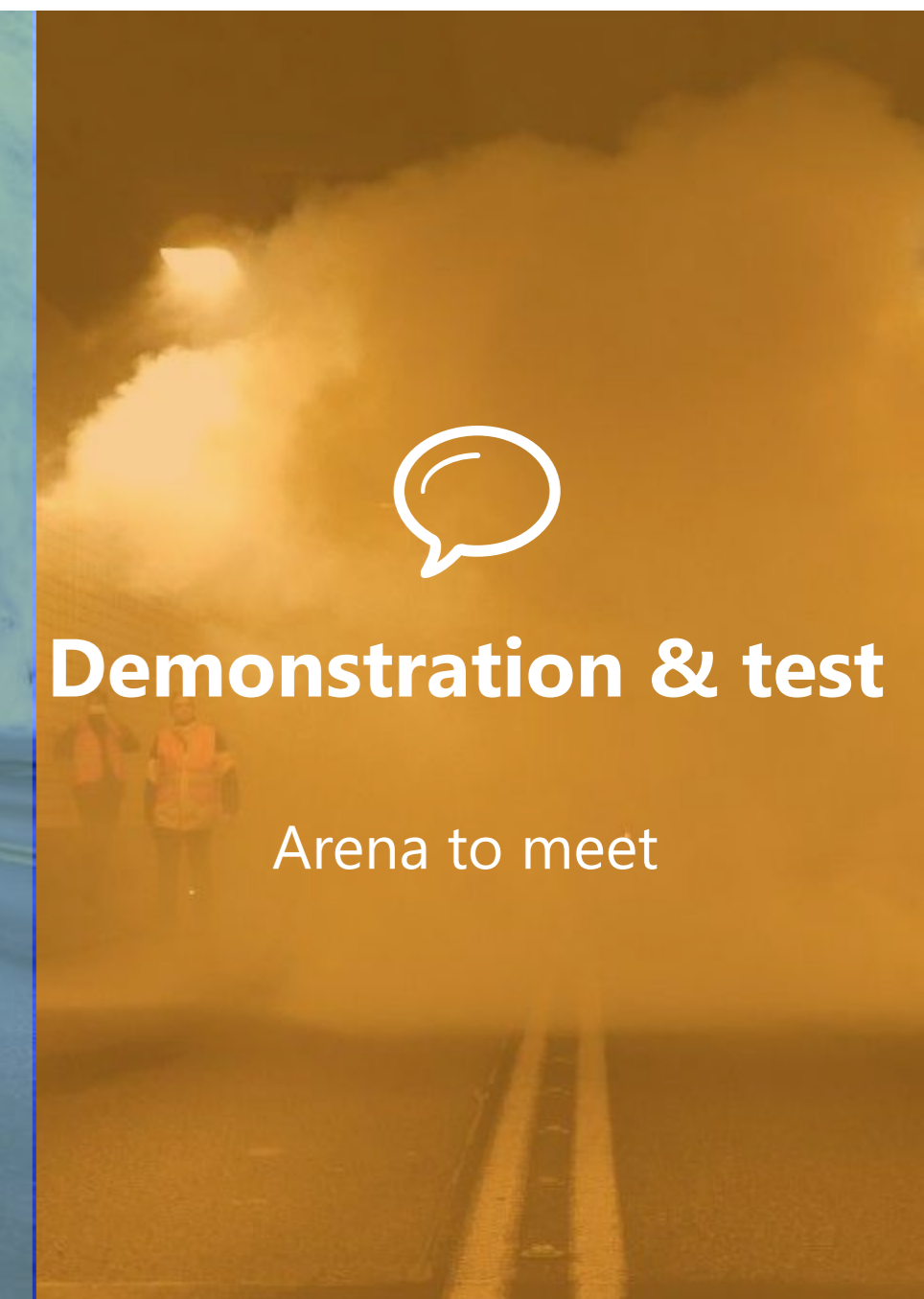
A 30-hour basic training in tunnel effort and rescue, with the main focus on tactical training in reconnaissance and information retrieval, search and rescue, and firefighting, is considered as basic skills training in Europe.

European authorities believe that proper decisions from management and proper understanding of fire fighting and rescue will save lives and safeguard the safety of firefighters in a good way.



Norwegian Tunnel Safety Center

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VIDEO

More information:



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