European forum of road tunnel safety officers
Lyon 4th-5th November 2009

Per Ivar Østensen
Corinne Chiodini
Safety officers Norway
Norway

- 93000 km public roads
- 961 tunnels (858 km tunnels)
NPRA

Administrative Authority

Safety Officer

Tunnel managers

Director General

Directorate

East

South

West

Center

North

6 districts + projects

6 districts + projects

6 districts + projects

6 districts + projects

6 districts + projects
5 Safety officers i Norway

Northern Region
160 tunnels
(81 over 500m)
Mr. Per Ivar Østensen

Central Region
120 tunnels
(50 over 500m)
Mr. Odd Arne Rød

Western Region
470 tunnels
(170 over 500m)
Mr. Gunnar Gjæringen

Eastern Region
70 tunnels (27 over 500m)
Mrs. Corinne Chiodini

Southern Region
110 tunnels (43 over 500m)
Mr. Dag Ødegård
5 Traffic Control Centers

- 200 tunnels
  Mountain passes

- 300 tunnels
  6 mountain passes

- 60 tunnels

- 60 tunnels
  High traffic roads

- 65 tunnels
  High traffic routes
Norwegian tunnels are quite long

- The longest road tunnel, The Lærdalstunnel 24.5 km
Norwegian tunnels have low traffic

- The highest AADT, The Festningstunnel, in Oslo, 85,000
Need for road tunnels (low traffic)

- High mountains
- Tough weather
- Deep fjords
- Scattered populations
- Only 4.5 million people
Challenge in Norway

- Tough weather
- Winther
Challenge in West of Norway

- Harsh climate
- Landslides and avalanches
Challenge in North of Norway

- Reindeer !!!!!
Norwegian subsea tunnels
Subsea tunnel facts

• 24 subsea tunnels
• Traffic density between 100 – 7000 AADT
• Length between 1650 m - 7250 m
• Depth under sea level between -56 m – -287 m
• Gradients between 7% - 10%
Sub-sea tunnels

- Challenge for subsea-tunnels: Gradient

- Length and depth of some subsea-tunnels
Challenge in Norway

- Many old tunnels
- Small cross section
- Poor lighting
- Little and poor safety equipment
New project / tunnels

- Good lightning
- Safety equipment ok
- Operation and maintenance of so many tunnels
Need for road tunnels (high traffic)

• Environment
• Air pollution
• Noise
• Motorways downtown
Oslo has a complicated traffic system

• AADT 50000-85000
• Over 650 planned tunnel closures per year, i.e. 3-4 tubes per night
• Lack of deviation itineraries
• Each tunnel is equipped according to the directive
• But is the whole system safe enough?
"Safe enough"?

- EU-directive is not precise enough where we need it
- Our tool is **risk analysis**
- But how can we evaluate the quality of a risk analysis?
- How can we discuss risk analysis?
Subsea tunnel system with intersections, high traffic and queues

Complicated tunnel system may generate

- Incidents
- Lane closings
- Queues
- Further incidents
Longitudinal ventilation and traffic

- Only longitudinal ventilation in Norwegian tunnels
- The principle of self rescue implies no traffic congestion
- But avoiding congestion is a political issue
Tunnels are politically attractive

Dream or nightmare?
Main challenges in the East

- Increasing number of tunnels and complexity
- Upgrading of mechanical and electrical equipment is necessary
- Upgrading of traffic control centers
Thank you for your attention

Our National mountain, Stetind