



Statens vegvesen
Norwegian Public Roads
Administration

VegROS – RoadRVA

Risk and Vulnerability Analysis of roads in Norway



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Photo credit: Tor Erik Schrøder/NTB Scanpix

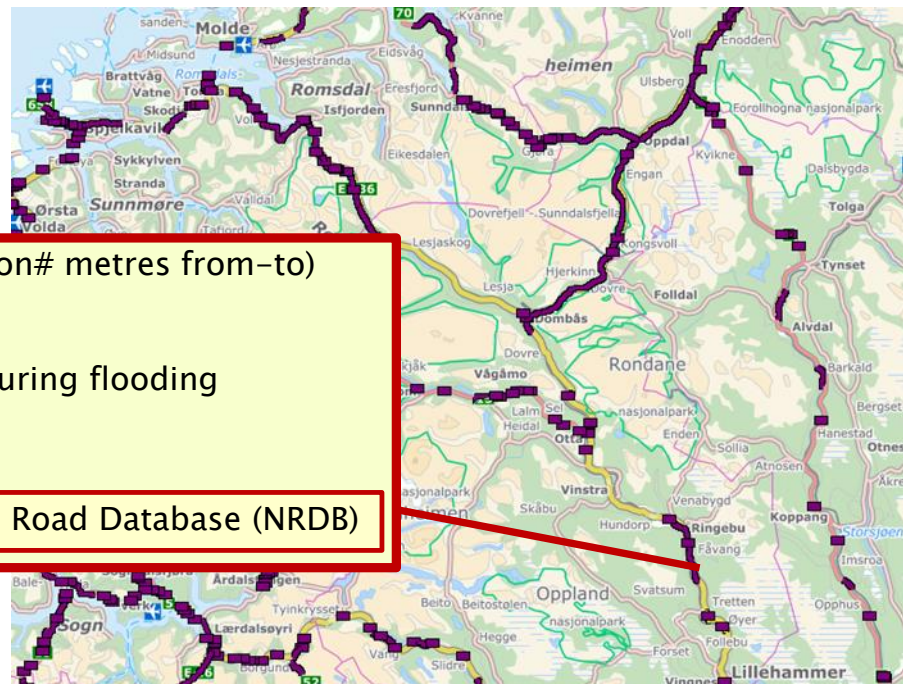
29/10/2018

5th Nordic Conference on Climate Change Adaptation October 23–25 2018, Norrköping, Sweden

Executive summary

What is VegROS?

- A measure of potential challenges to accessibility caused by disruption/closure of road infrastructure
 - National road network
 - «Risk» values = «Need to act»
 - Low
 - Medium
 - High



05 E6 HP13 m5040–5060 (County# Road# section# metres from-to)
Disruption type: Bridge closed
Disruption cause: Flooding
Description: Danger of erosion of foundations during flooding
Threat: Medium
Importance: High
Vulnerability: High
Risk: Medium

National Road Database (NRDB)



For the record

History

- 2005/2006
 - First survey of potential disruption challenges along national transport corridors
- 2011
 - Second survey, initiated by Ministry of Transport, focussing on the 10 most important challenges in each of the 5 NPRA regions in Norway
- 2014/2015
 - VegROS V1
 - Downtime > 12 hrs = High risk, no evaluation of likelihood, black swans
- 2017
 - VegROS V2
 - Comprehensive method, weighted matrix
- 2019
 - VegROS V3
 - Alignment with other RVA-methods used by different sections of NPRA



Climate adaptation in the transport sector

Government strategy documents

- **Ministry of Transport**
 - Strategy for societal security
 - Climate changes must be taken into account in planning, building, operating and maintaining infrastructure.
 - New infrastructure must be built to withstand tougher climate impacts.
- **NPRA**
 - Strategy for societal security and climate adaptation
 - Build more robust infrastructure and limit vulnerabilities.
 - Ensure that climate adaptation is part of decision-making for prioritising actions for operating and maintaining administering infrastructure.
 - Develop a knowledge base through monitoring, mapping and data collection.



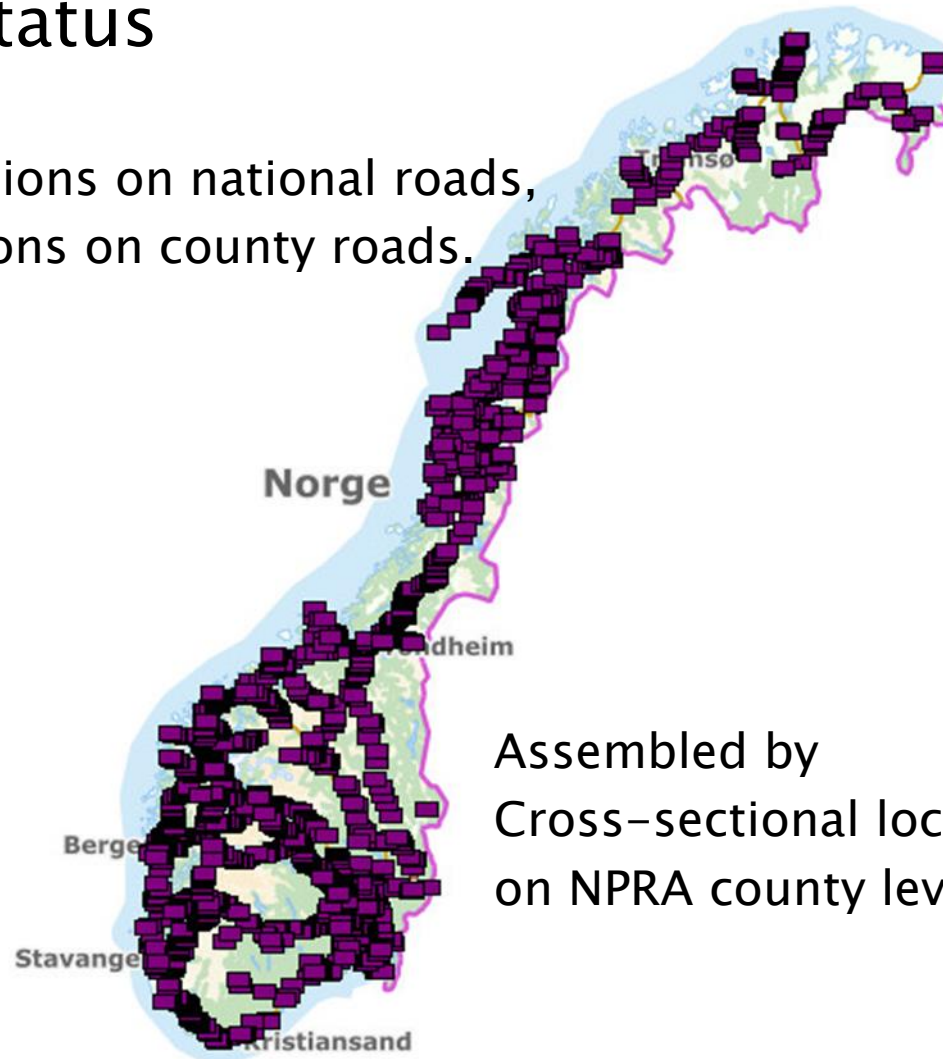


Quick glance

Current status

Currently

1 800 registrations on national roads,
400 registrations on county roads.

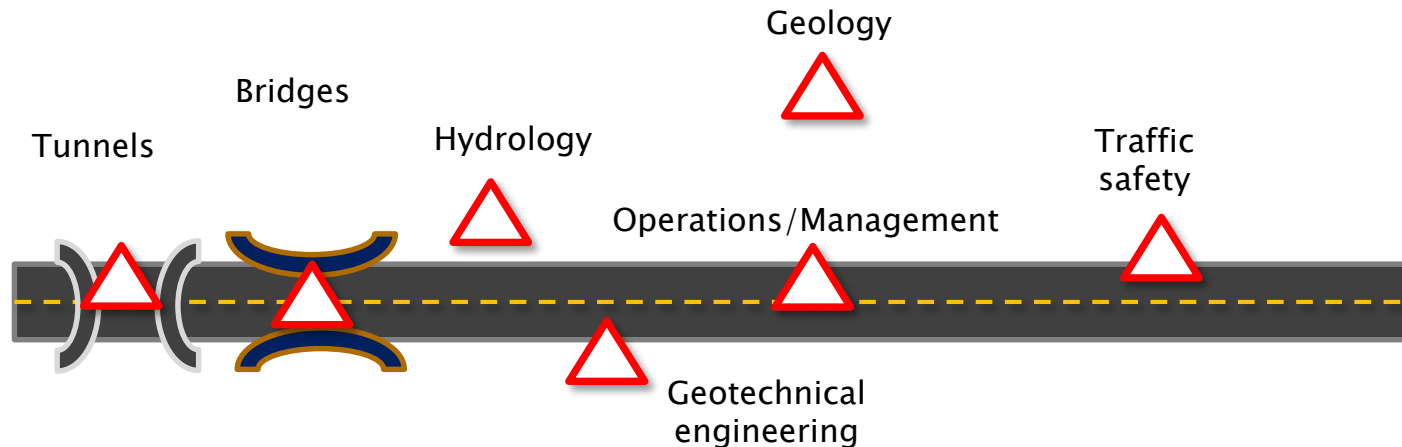


Assembled by
Cross-sectional local work groups
on NPRA county level

VegROS – Step by step



- Assemble local work teams consisting of different sections of NPRA
- Collect most important trouble spots within each field/section along selected road stretches
- Establish a common understand of which trouble spots that should be addressed.
- Evaluate trouble spots. Climate change issues are a required part of this evaluation.





Disruptions and causes

VegROS in brief (1)

Type of disruption
Road closed
Bridge closed
Tunnel closed
Ferry link closed

Cause of disruption
Fire (in objects on or near the road)
Rescue and towing (HGV)
Accidents (non-fatal)
Restrictions (length, height, weight, width)
Hazardous goods transport
Power outage
Foundation failure
Flooding
Drainage failure
Storm surge
Landslide
Quick clay slide
Rock slide
Snow avalanche
Wind
Weather

Disruption types/events

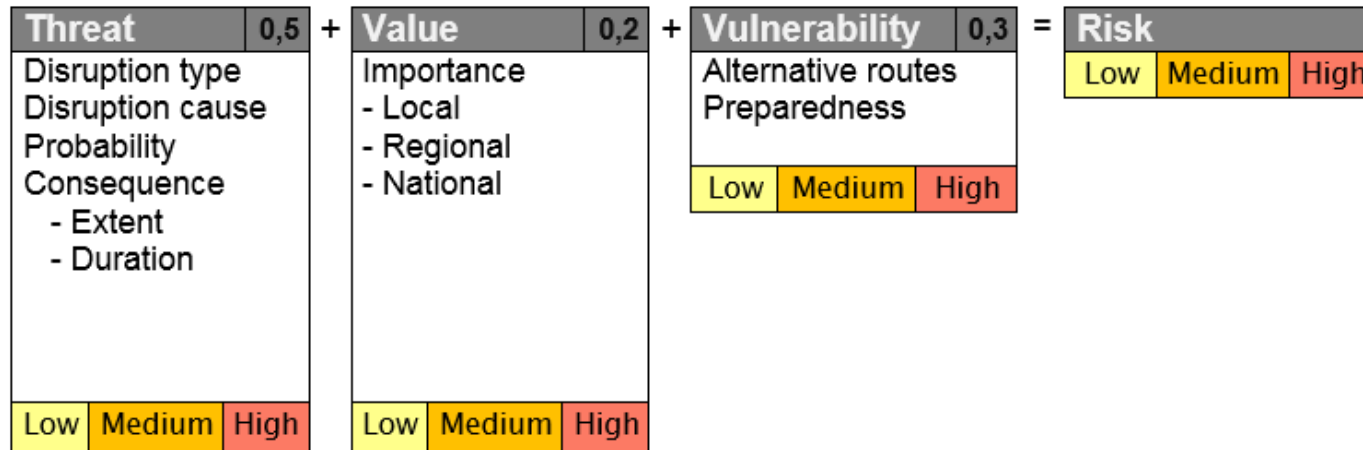
**Road,
Bridge,
Tunnel, or
Ferry link** closed

are evaluated
for a pre-defined set of causes



Risk calculation

VegROS in brief (2)



The potential for disruption is given a «risk» value
Low, Medium or **High** risk
based on a weighted evaluation of

Threat

What can happen, how likely is it, how extensive or how long-lasting is it?

Value

How important is the road, who is it important for?

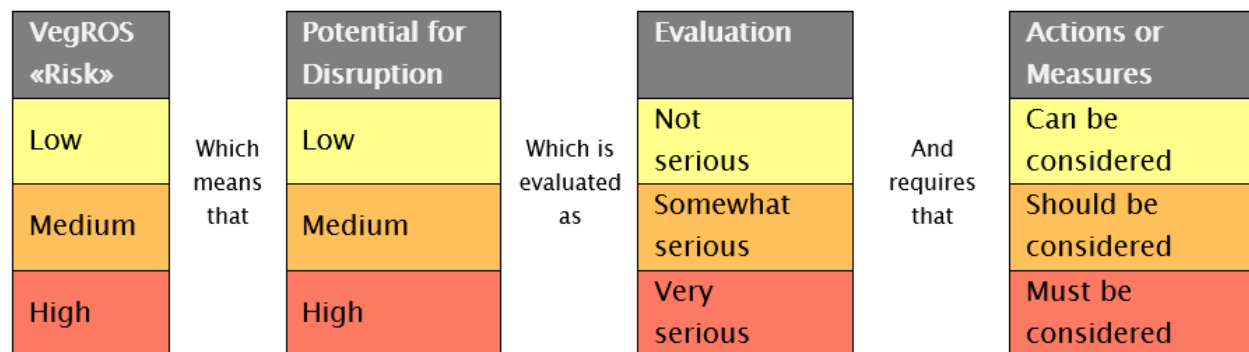
Vulnerability

Are there alternative routes, how prepared are we for this?

Important

VegROS provides the groundwork only

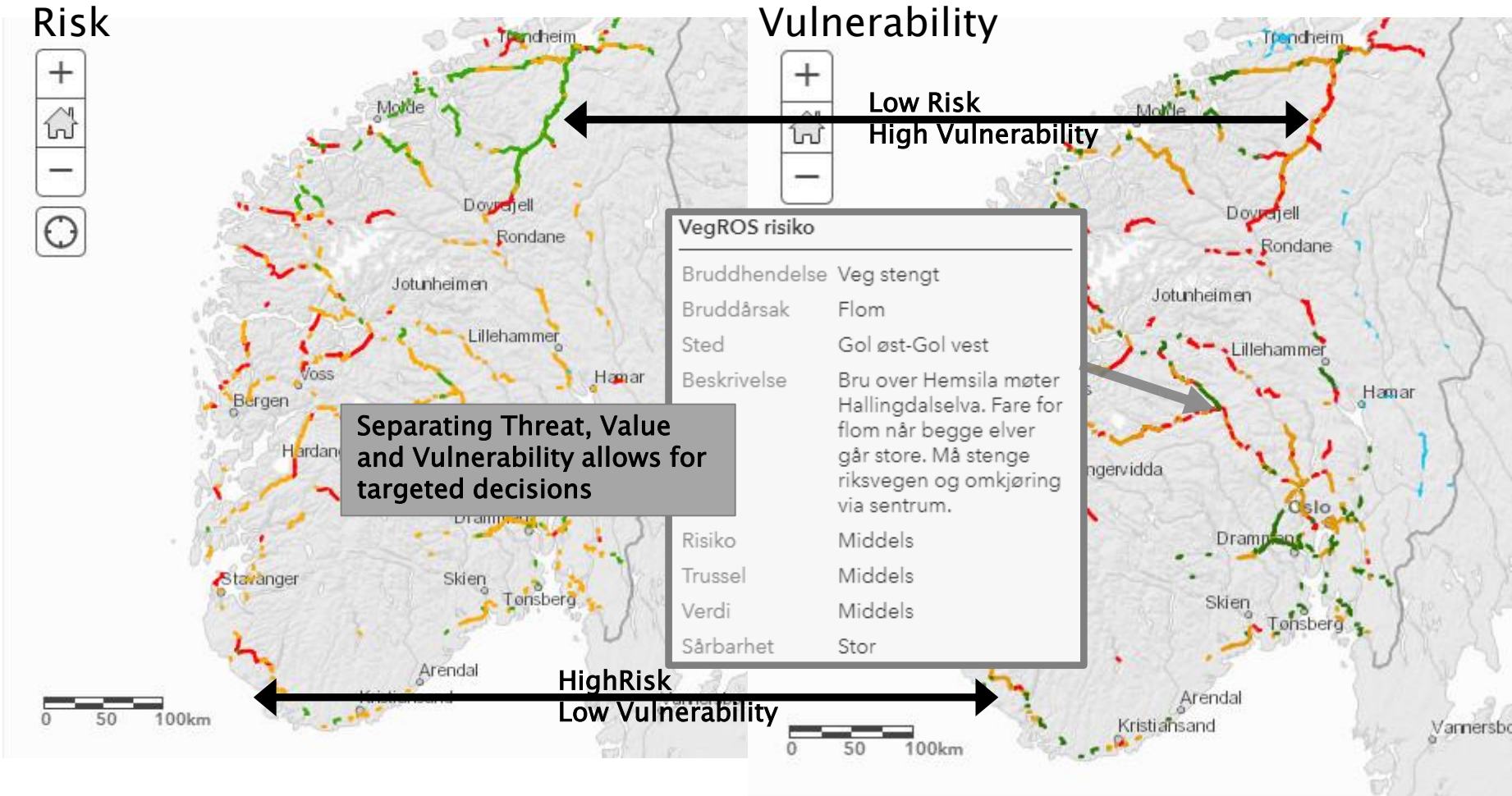
- VegROS is not a detailed and complete RVA
 - Preliminary and qualitatively only
- VegROS provides an overview
 - The most important accessibility challenges
- VegROS is an entry point for further analysis and actions
 - Investment/improvement, maintenance/operation, contingency plans, more detailed risk analyses
- «Risk» in VegROS relates to requirement for actions/measures





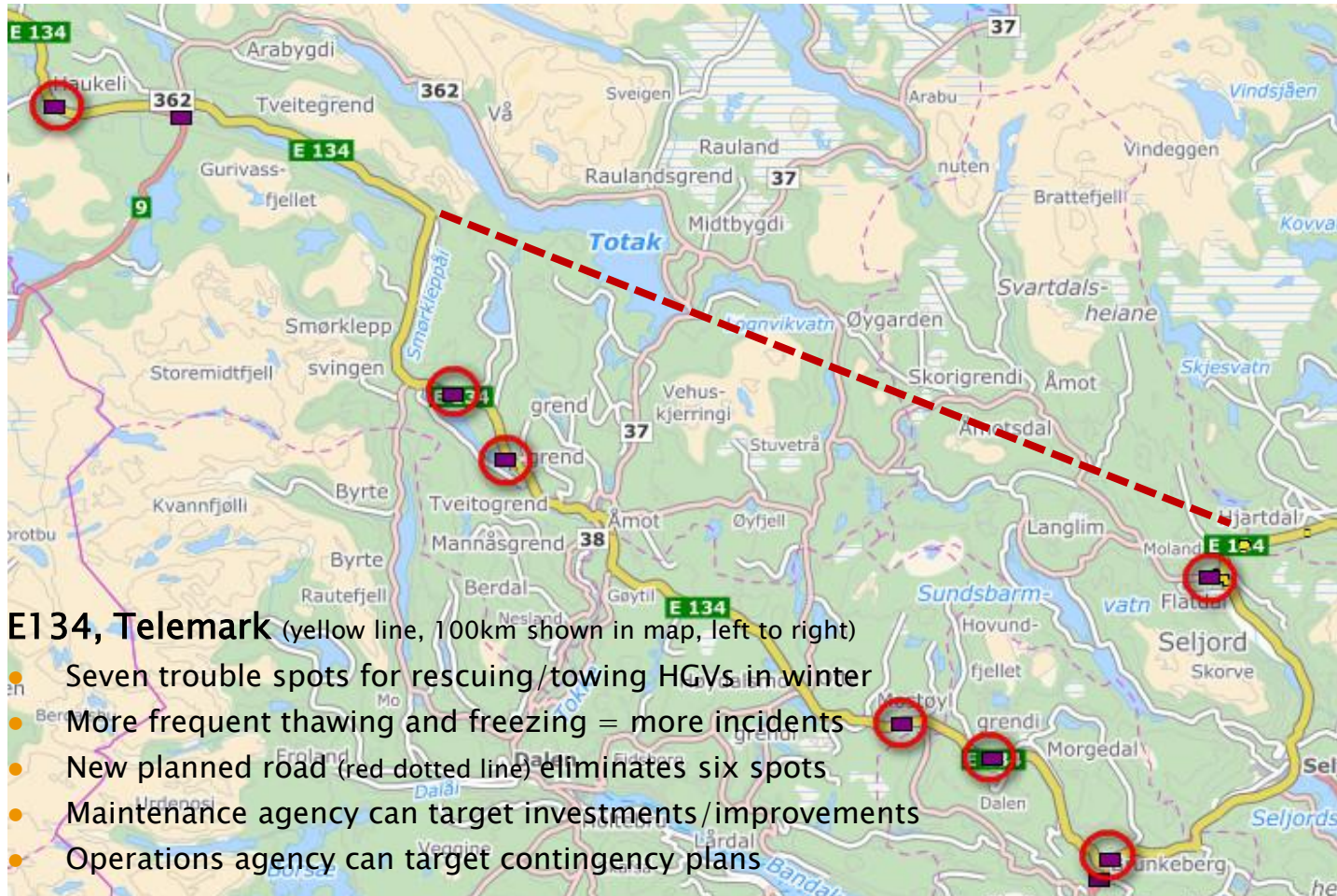
How to use VegROS (1)

Risk vs. Vulnerability



How to use VegROS (2)

VegROS and climate challenges – example



E134, Telemark (yellow line, 100km shown in map, left to right)

- Seven trouble spots for rescuing/towing HGVs in winter
- More frequent thawing and freezing = more incidents
- New planned road (red dotted line) eliminates six spots
- Maintenance agency can target investments/improvements
- Operations agency can target contingency plans



A sound methodology?

Pros and Cons

- Local work groups
 - Local ownership, local knowledge
 - Dissemination of knowledge across sections/fields
 - Common understanding of most important hotspots
- Qualitative
 - Same type of disruption may be evaluated differently by the different local works teams
 - Inconsistent risk on a regional/national level

Thank you!

That's all Folks!

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