

Rijkswaterstaat  
Ministry of Infrastructure  
and Water Management

# Dutch Highway Network Climate Stresstest Results and the way forward

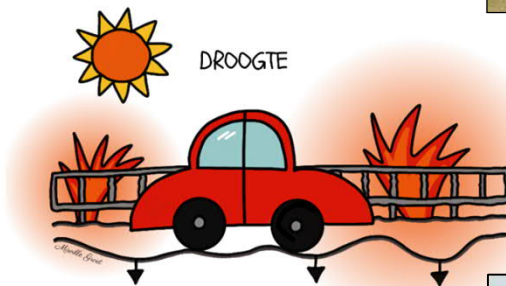
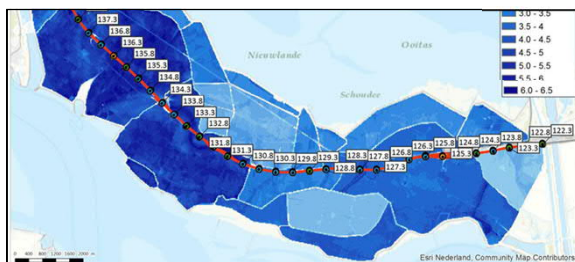
EU4CLIMATE Webinar February 15, 2021  
Adaptation planning and the mainstreaming of climate  
risks into sectoral planning

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The Netherlands



# Content

- Introduction and policy
- Dutch Highway Stresstest
- Regional validation, risk dialogues and further steps







## Short and long term effects due to extreme weather



dealing with uncertainty - climate change is (just?) one aspect



# Stresstest follows from Climate Change Adaptation Policy

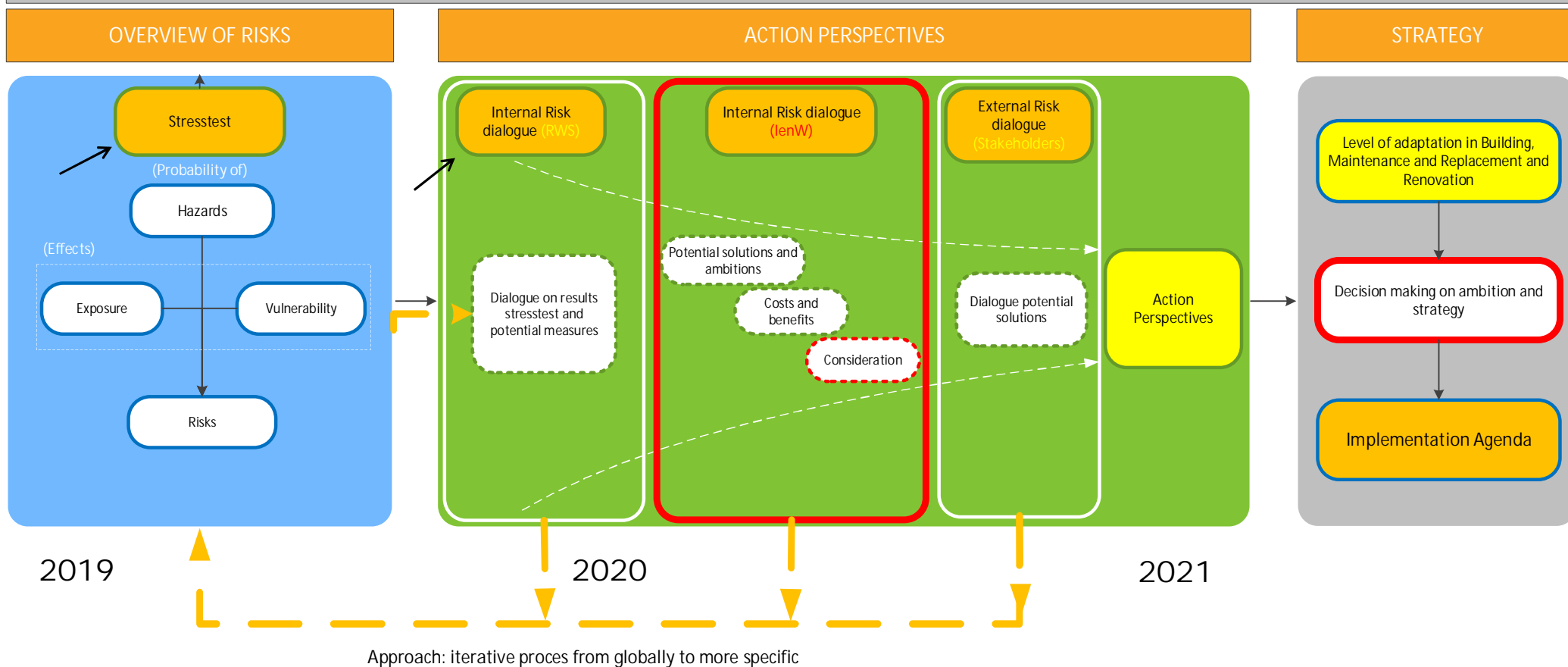
Delta Program > DeltaPlan for Spatial (climate) adaptation

Netherlands as climate-proof and water-resilient as possible by 2050

By 2020 parties have incorporated climate-proof and water-resilient planning into policies and actions



## ROADMAP Climate Resilient Networks : an iterative process





# Threats-hazards in Highway Stresstest

- Extreme rainfall - pluvial flooding
  - water on the road
  - Bad visibility
  - Erosion, instability of embankments
  - Uplift of tunnels and light materials
- Fluvial and coastal flooding
- Heat
  - Thermal expansion of pavements
  - Bridges get stuck
  - Possible failure of electrical systems
- Drought
  - Unequal settlements due to drought related soil subsidence
  - fires





Interactive maps and information >>

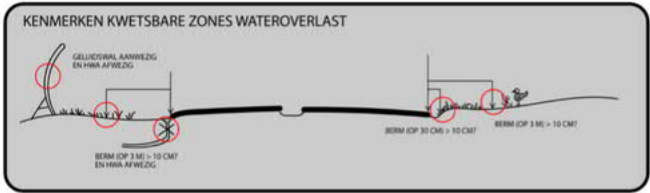


HWN Viewer

- Wateroverlast
- Overstromingen
- Droogte
- Hitte

1 Plasvorming

Door de toename van hevige neerslag neemt het risico op plasvorming op de weg toe. Water op de weg wordt hierbij gedefinieerd als ‘plas’ bij een waterdiepte van >1 cm. Zowel de frequentie als de diepte van plassen nemen toe. Het hemelwater kan dan niet snel genoeg worden afgevoerd. Dit kan zowel voorkomen bij tunnels en onderdoorgangen (via-, aqua- en econduct) als bij bemalen wegdelen.



Figuur A. Typering kwetsbare zones voor plasvorming

Kwetsbaarheden

De kwetsbaarheid voor plasvorming op de weg wordt bepaald door de volgende factoren:

- In boven-normatieve situaties (HWA-norm) zijn locaties zonder HWA kwetsbaarder dan locaties met HWA.

2 Opdrijven tunnels, verdiepte liggingen en aquaducten

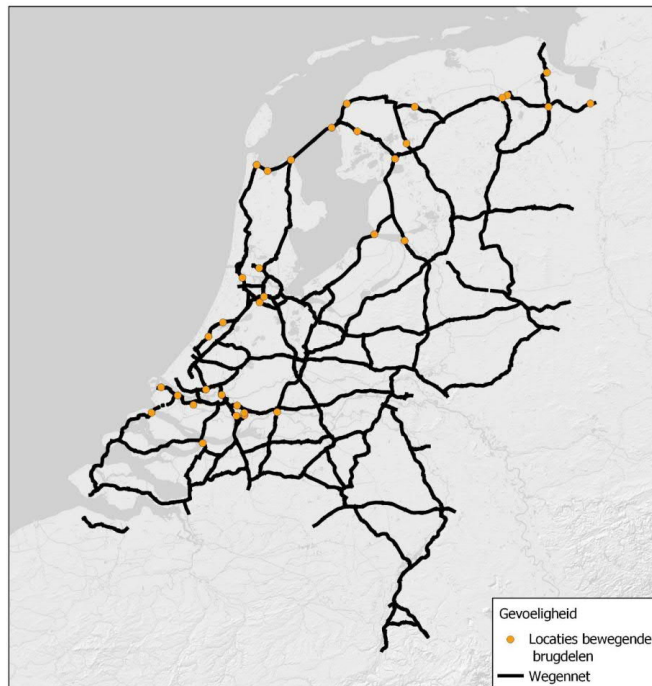




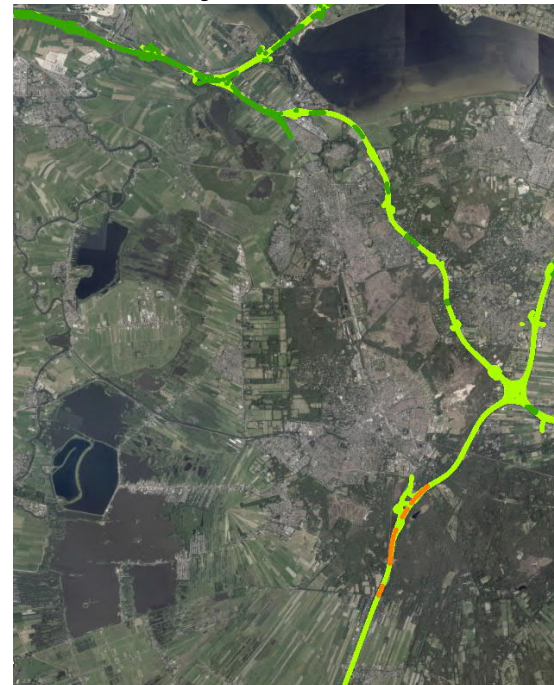


# Highway Stresstest results

Vulnerable bridges



Vulnerability of roadsides to fire

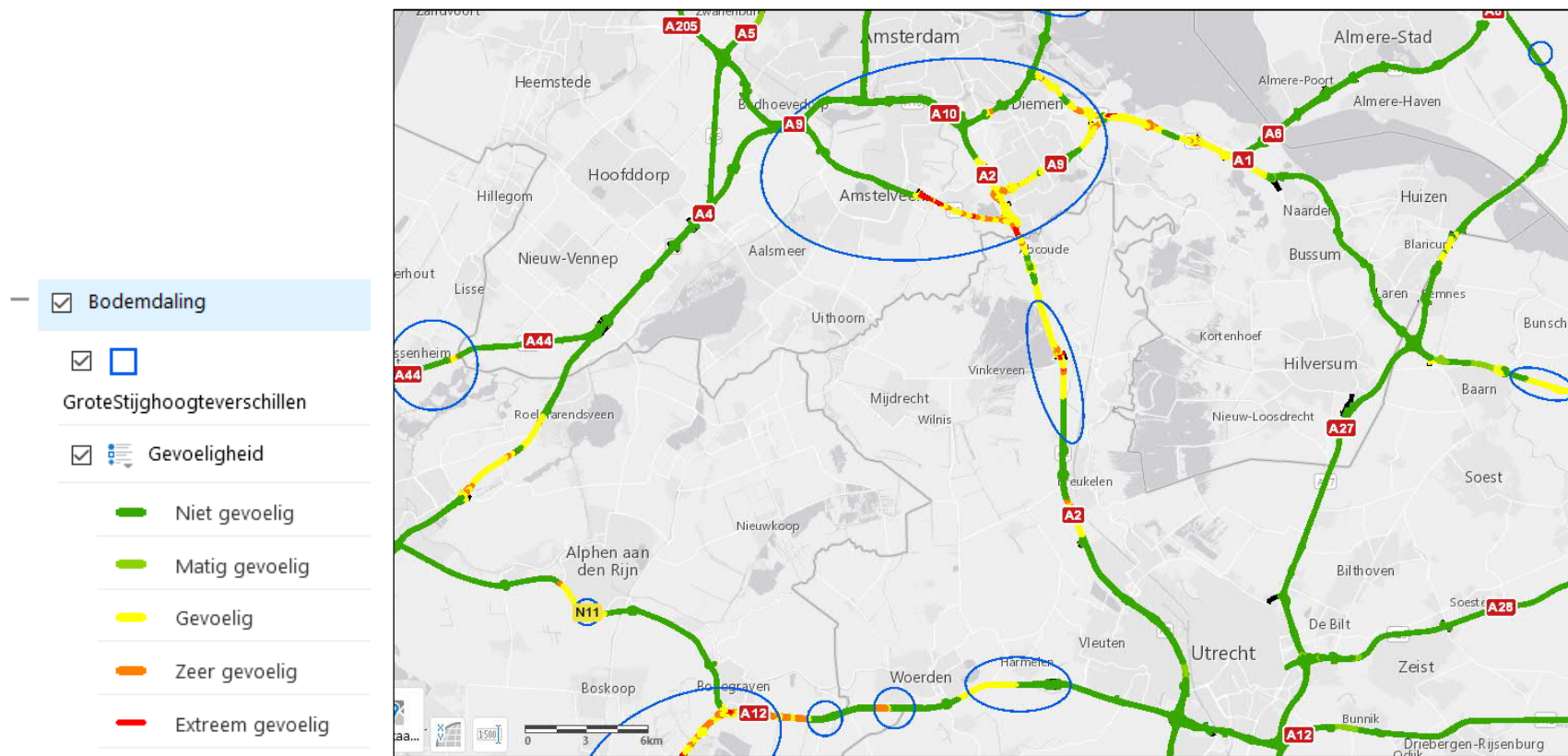






# Highway Strestest Results:

vulnerability to more soil subsidence by drought











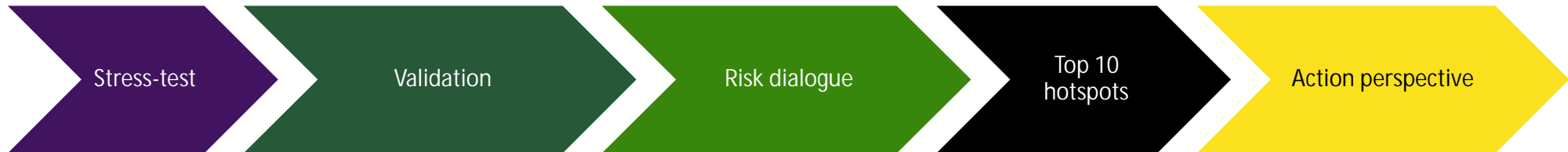
# Climate resilient infrastructure

from stresstest to regional action perspective and measures





# Towards a top 10 hotspots and possible measures

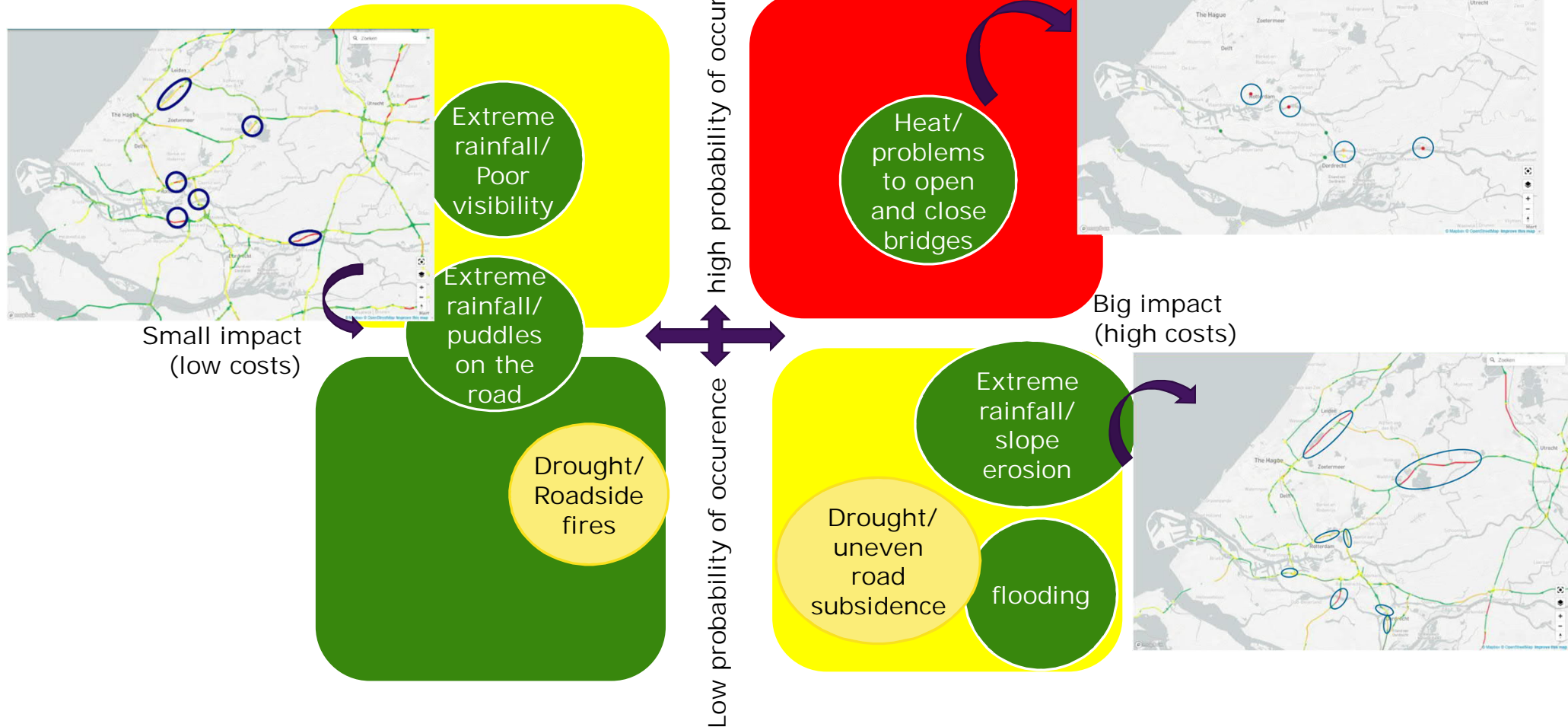


## Key questions in risk dialogues:

- What are the most important climate risks?
- Indicate hotspots for each climate risk
- Risk matrix: which level of resilience is acceptable?
- What measures can we take and where to start?



# Climate risks and hotspots in West Netherlands

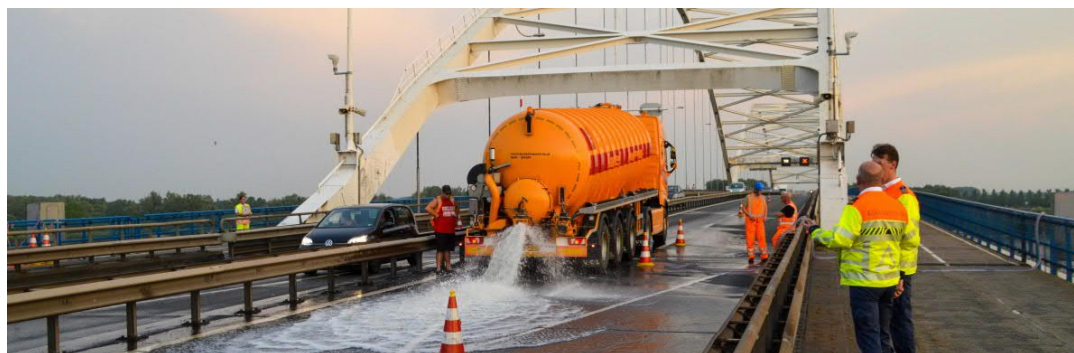




		EFFECTS			
		1: NEGLIGIBLE	2: LIMITED	3: HUGE	4: SEVERE
RAMSSHECP	A	Quite short nuisance to primary functions of the object; no nuisance to the network	Nuisance to the network is shorter than the lower threshold of all functional categories: 1. road traffic 2. maritime transport 3. water management	Nuisance to the network is shorter than the upper threshold of all functional categories, but longer than the lower threshold in one or more of the functional categories: 1. road traffic 2. maritime transport 3. water management	Nuisance to the network is larger than the upper threshold in one or more of the functional categories: 1. road traffic 2. maritime transport 3. water management
	M	Local repair easily executable	Repair with extra effort (e.g. due to special equipment or waiting period for spare parts)	Repair with lots of effort (e.g. execution of maintenance by forced access or waiting period for special spare parts or permits)	Repair outweighs the economical lifespan of the object; alternatively measurements are required (e.g. full-scale replacement)
	S	The failure will directly or indirectly lead to accidents with temporary injury without the absence of one or more people	The failure will directly or indirectly lead to accidents with temporary injury which requires medical assistant/hospital visit to one or more people	The failure will directly or indirectly lead to accident with lasting injury to one person	The failure will directly or indirectly lead to: - lasting injury to multiple people - fatal injury to one or more people
	SE	Possible undesirable human activities with little effects such as graffiti	Possible undesirable human activities with limited effects such as accessibility to unimportant areas	Possible undesirable human activities with huge effects such as digitally or physically access to confidential information	Possible undesirable human activities with severe effects such as digitally or physically access to (emergency) control of the object
	H	Health nuisance to one or more people on the long term	Temporary health damage to one or more people on the long term	Lasting health damage to one person	On the long-term: - lasting health damage to multiple people - fatal health damage to one or more people
	E	Negligible effect on flora and fauna	Limited effect on flora and/or fauna; no measurements required, will be resolved	Huge effect on flora and/or fauna; measurements required to prevent further effect	Severe, long-term effect on flora and fauna; full-scale measurements required
C	C	Effect cost between the €100,- and €10.000,-	Effect cost between the €10.000,- and €100.000,-	Effect cost between the €100.000,- and €500.000,-	Effect cost above the €500.000,-
	P	Complaints	Locally reputational damage	Regionally reputational damage	National reputational damage



## Risk matrix



Risk Matrix		EFFECT			
		1: NEGLIGIBLE	2: LIMITED	3: HUGE	4: SEVERE
CHANGE	1: NEGLIGIBLE	Acceptable	Acceptable	Acceptable	Acceptable
	2: SMALL	Acceptable	Acceptable	Undesirable	Undesirable
	3: AVERAGE	Acceptable	Undesirable	Undesirable	Undesirable
	4: HUGE	Acceptable	Undesirable	Undesirable	Unacceptable
	5: CERTAIN	Undesirable	Undesirable	Unacceptable	Unacceptable





Action perspective

Possible measures

Mainstreaming measures in

- Performance management - maintenance
- Replacement and renovation program

Environmental management





## More information

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Drawings

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