Rijkswaterstaat
Ministry of Infrastructure and the Environment

Assessment of risks for highways in the Netherlands due to Climate Change

EIB - Jaspers meeting
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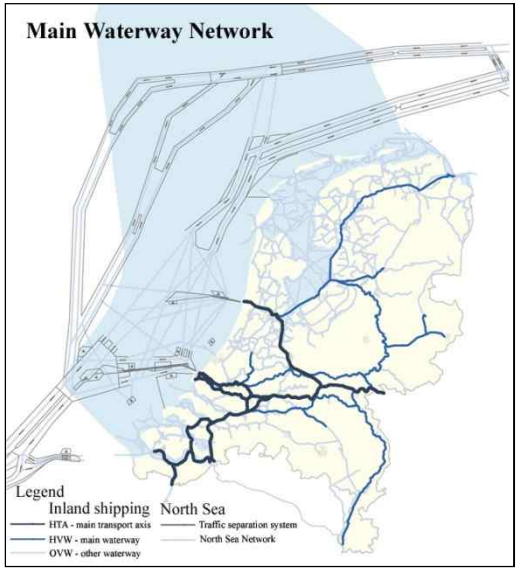
Content

- Introduction Rijkswaterstaat
- Why do we assess risks
- Methods – tools
- Examples
- Conclusion

Botlek area, Rotterdam Harbour

Rijkswaterstaats Infrastructural networks

Highway network: 3.102 km



Waterway network: 8.000 km

Water system 90.000 km2

Rijkswaterstaat Mission

- Protection against flooding
- Sufficient clean water
- Smooth and safe transport by road and water
- Reliable and useful information
- Sustainable living environment

Three roles: network manager, project manager and crisis manager

Uncertain future



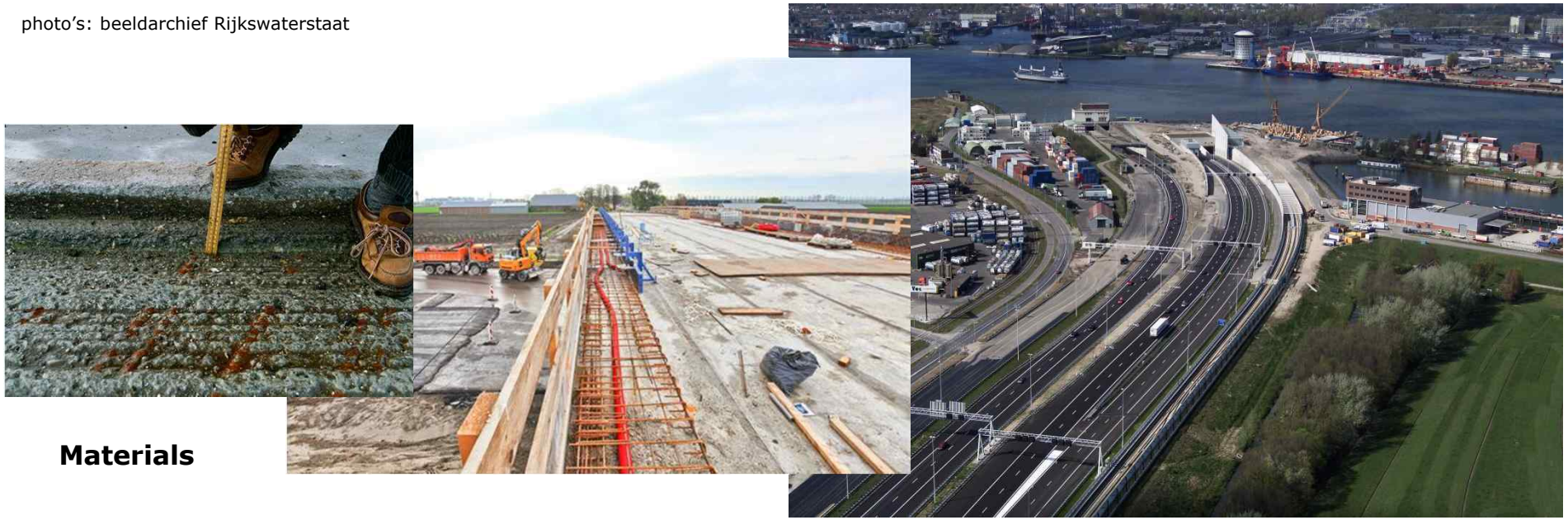
more dependancy on telecom, electricity, chain effects

influenced by climate and extreme weather




Impacts of Climate Change on different levels

photo's: beeldarchief Rijkswaterstaat

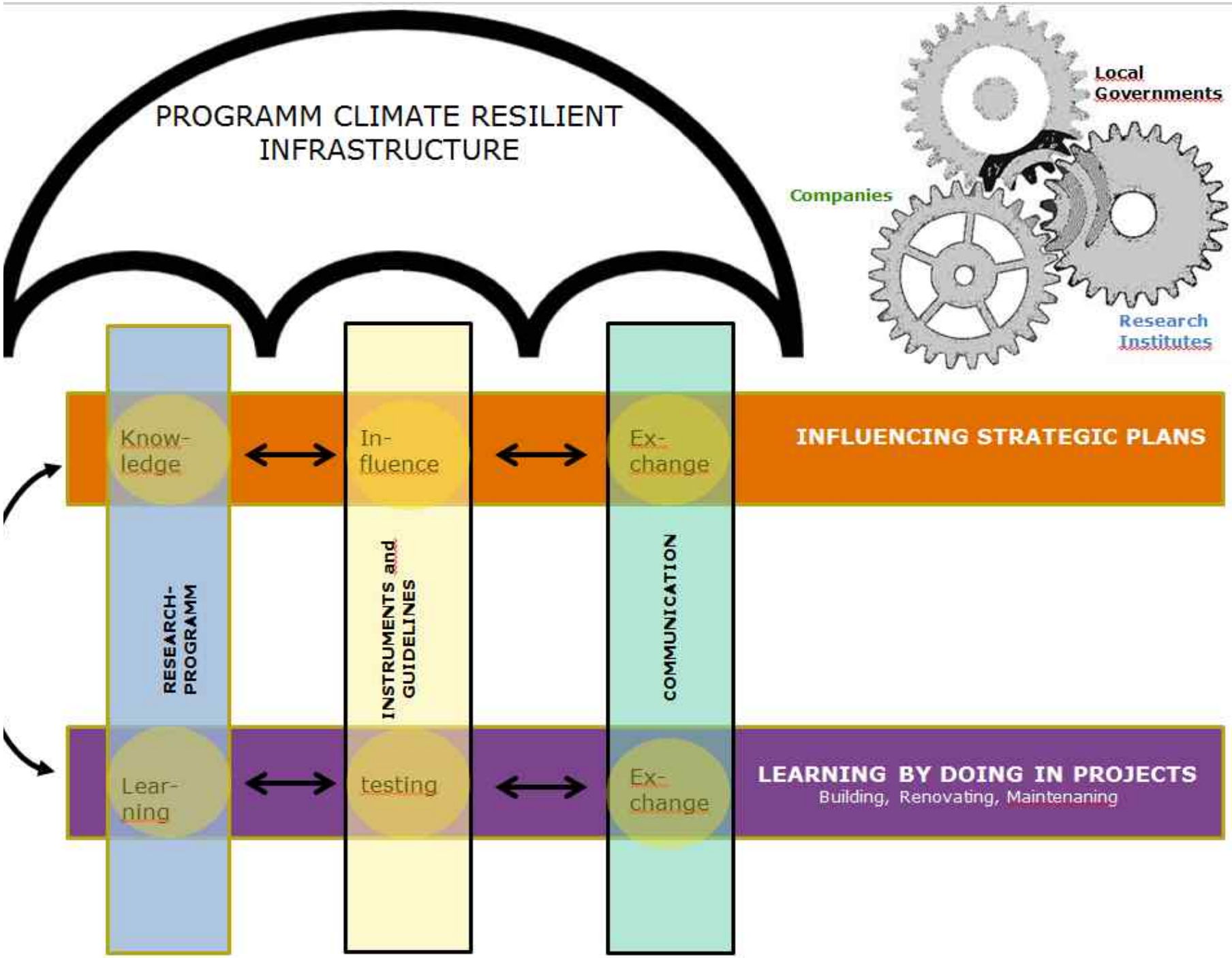


Materials

Objects

System

what are the costs – what investments are necessary, efficient ?


PROGRAMM CLIMATE RESILIENT INFRASTRUCTURE
Local Governments
Companies
Research Institutes
Know-ledge
In-fluence
Ex-change
INFLUENCING STRATEGIC PLANS
RESEARCH-PROGRAMM
INSTRUMENTS and GUIDELINES
COMMUNICATION
Lear-ning
testing
Ex-change
LEARNING BY DOING IN PROJECTS
Building, Renovating, Maintenaning

Rijkswaterstaat program
Climate resilient infrastructure

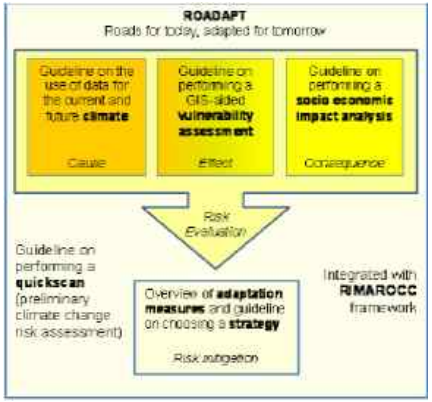
- Which performance do we accept in the future?
- Adapt on key moments: when planning, building, maintaining, replacing
- Risk-based assetmanagement
- Learning by doing: PILOTS (projects and regions): learning, testing, exchanging
- Work together with: water authorities, municipalities, research institutes

Applied methods and tools in The Netherlands

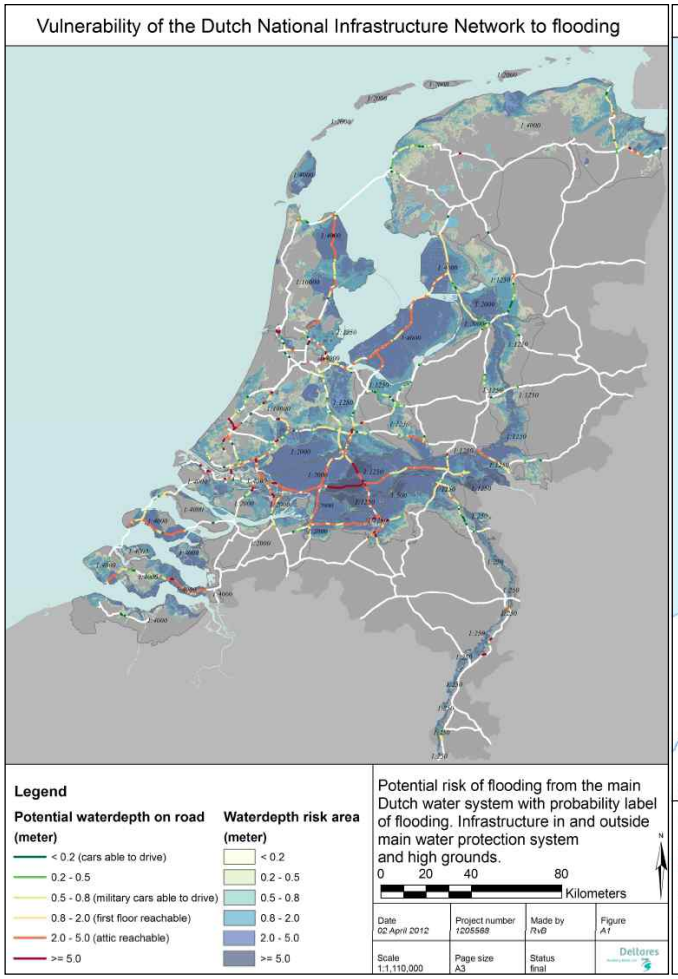
CEDR – European road owners adapting to Climate Change calls:
2008, 2012, 2015 (http://www.cedr.eu/?s=climate)

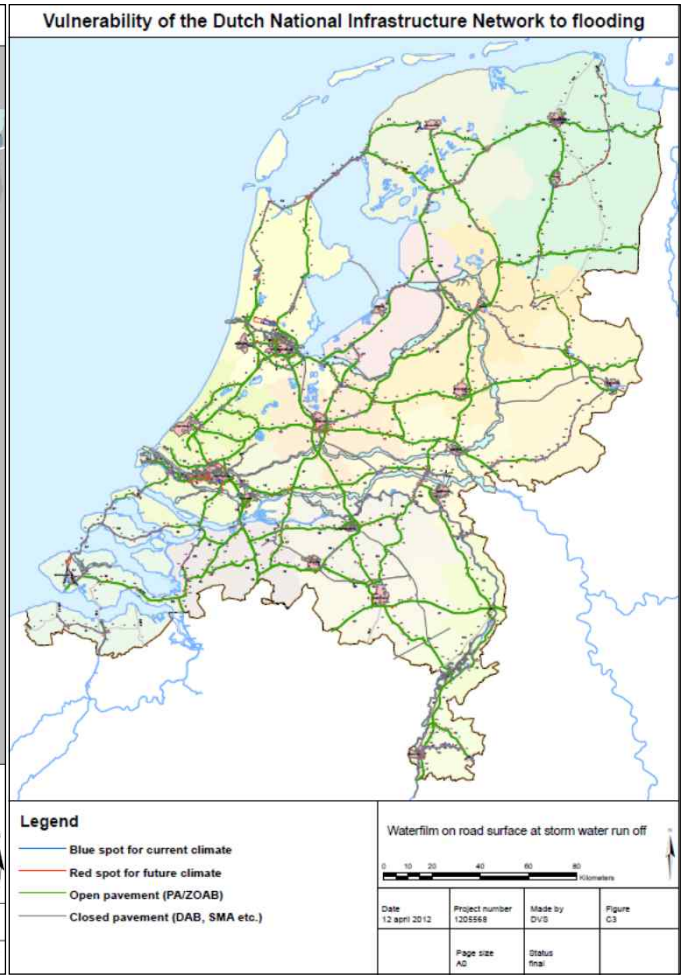
- SWAMP (2008 call) > Investigation of blue spots in the Netherlands
- ROADAPT(2012 call) > input for InnovA58 Plan Development Phase

Several tools available, like Guide for stresstest and Climate Impact Atlas, focus on urban areas, on http://ruimtelijkeadaptatie.nl/english



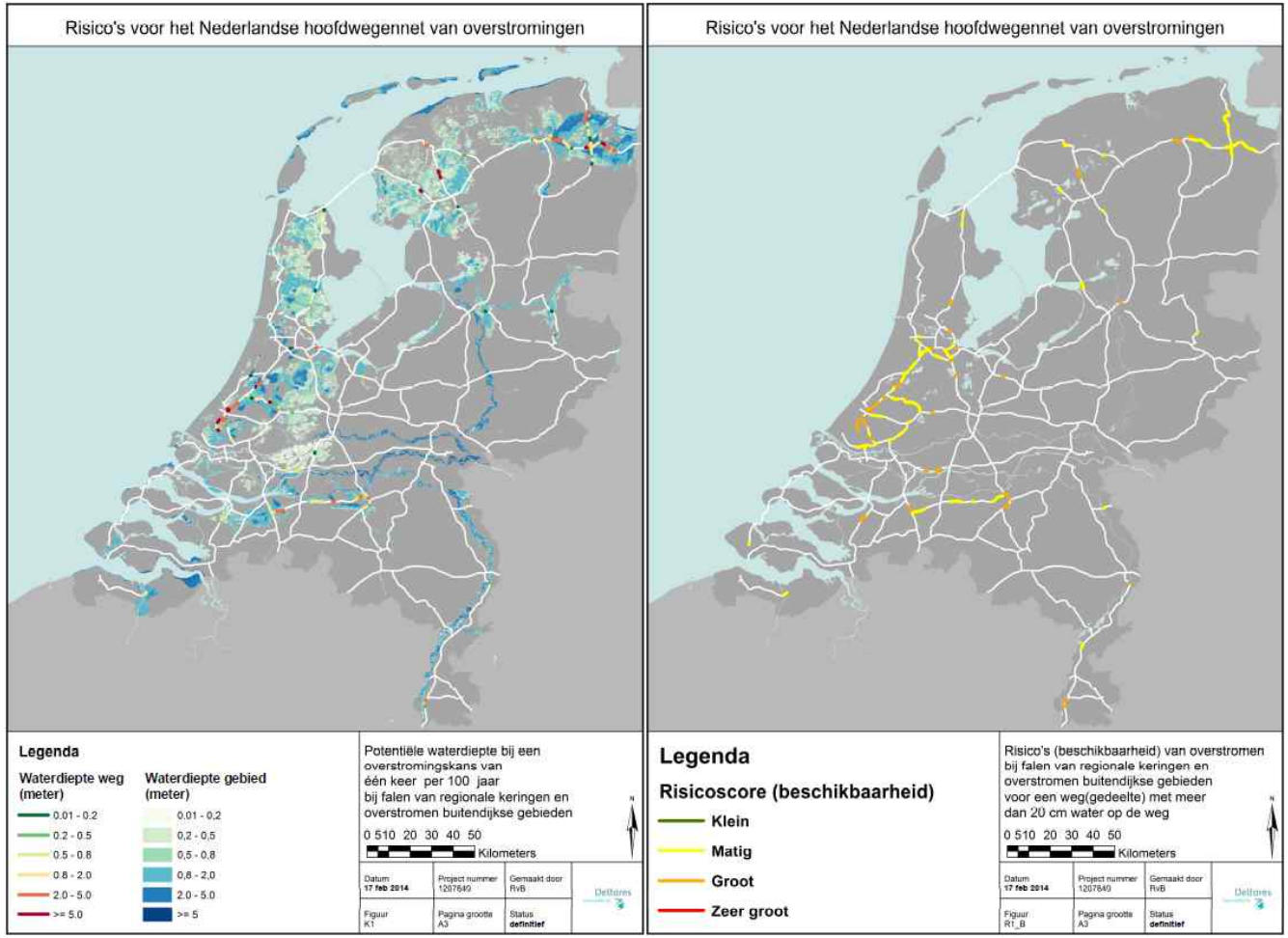
Investigation of blue spots (2012)





Water op de weg door 1x per 10 jaar buien, nu en in 2050

Maps for regional flooding, risk maps

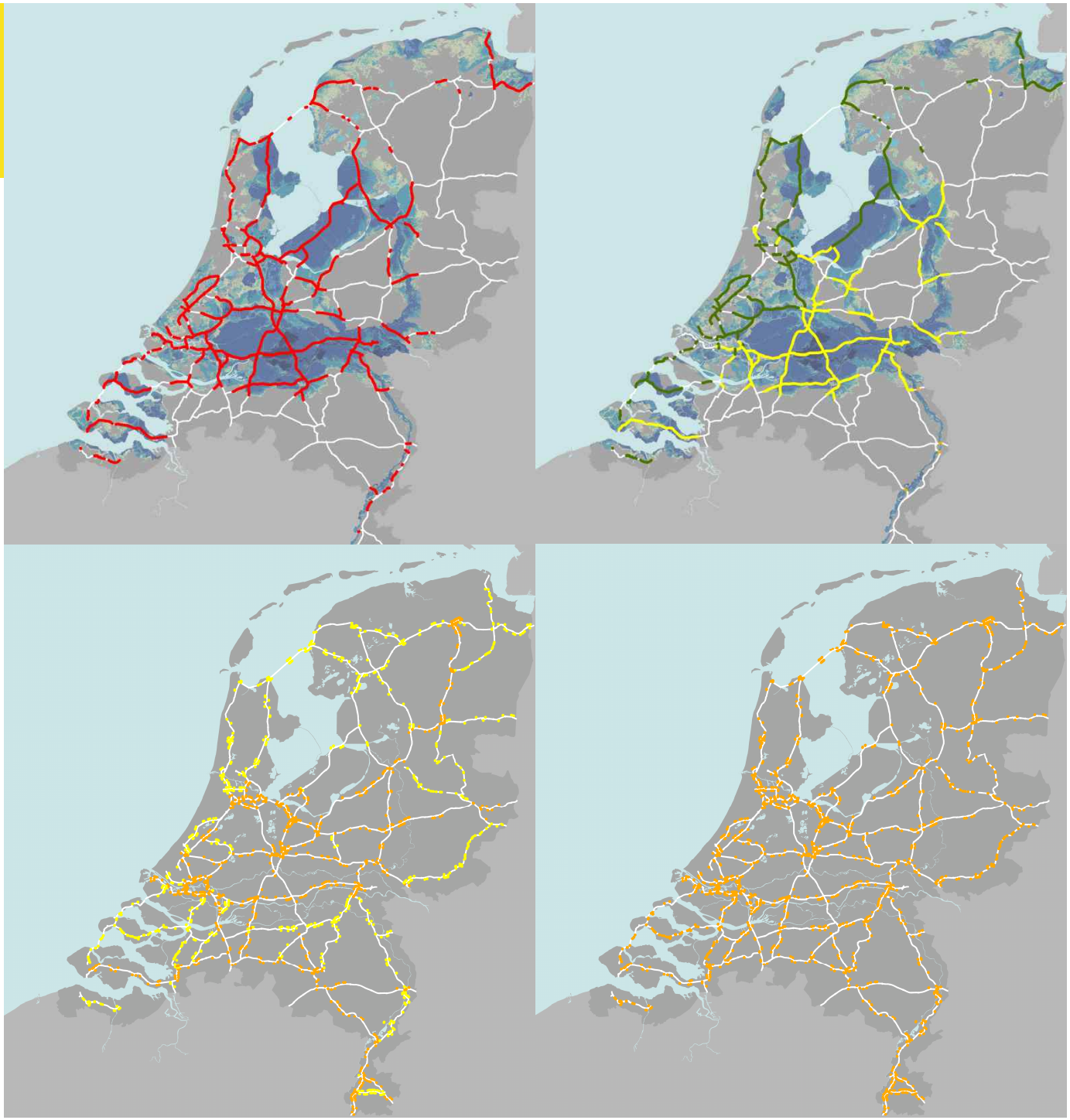


Rijkswaterstaat

Blue spots

Flooding from primary defences
> Major damage,
Low to moderate risks

Extreme rain, water on the road
>Moderate to major damage,
Major risks

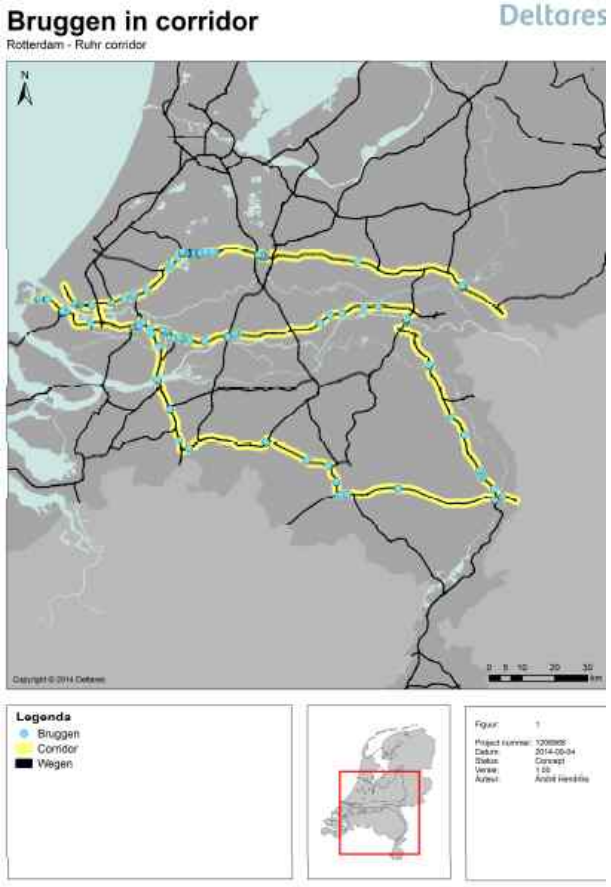


Rotterdam – Ruhr corridor – Roadapt Quickscan

Top risks identified in workshops:

- Flooding due to failure of secondary flood defences
- Inundation of roads in coastal areas due to sea level rise and storm surges
- Overloading of hydraulic systems crossing the road
- Bridge scour

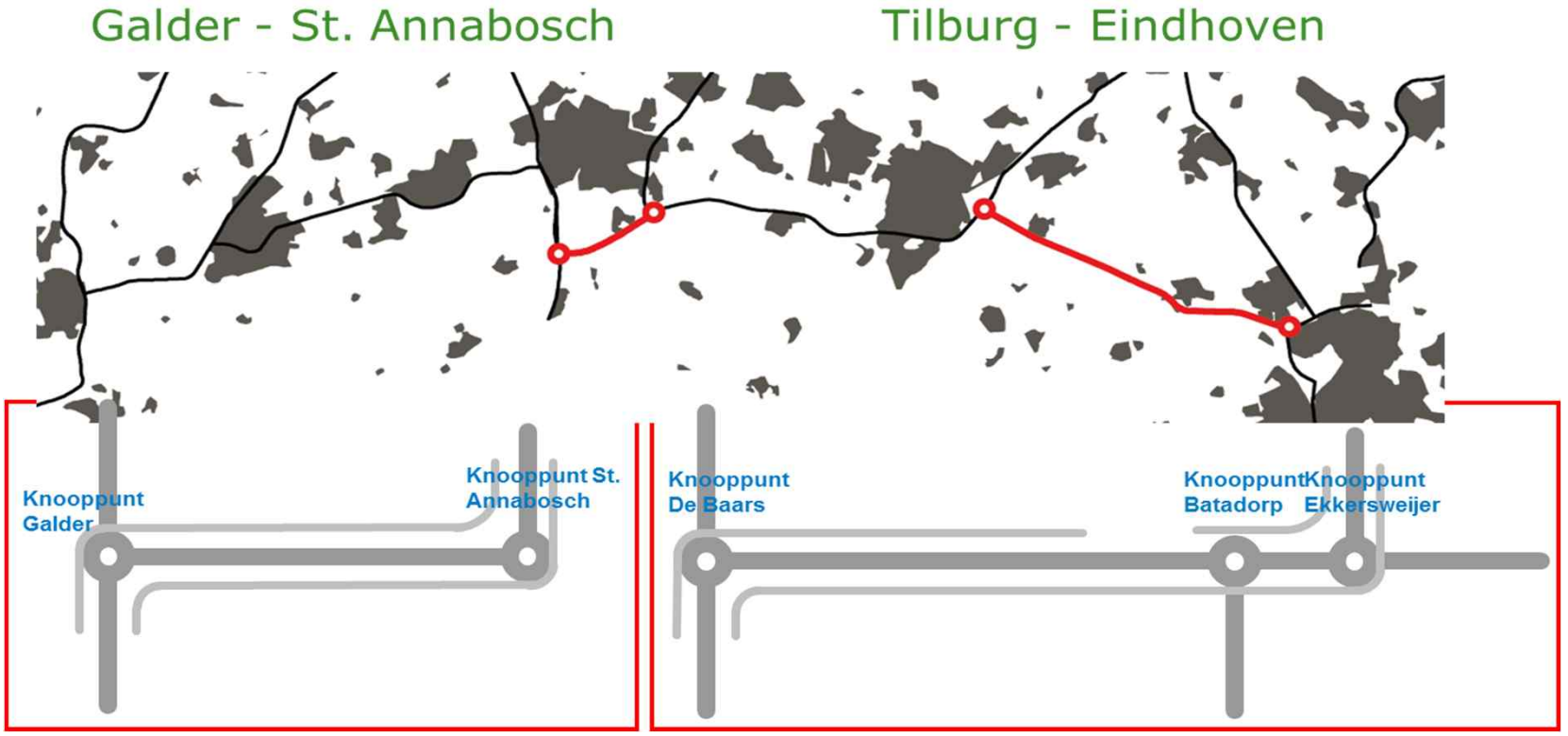
Currently the vulnerability in the area will be updated !!



re 6.5 Bridges in roads

The InnovA58 project

Perfect test case – Plan development phase



Aim of InnovA58 project

- Increase the robustness and resilience of the InnovA58 and its surrounding environment for the effects of climate change, now and in the future
- Derive lessons for broader application in the main Dutch highways network

Challenge

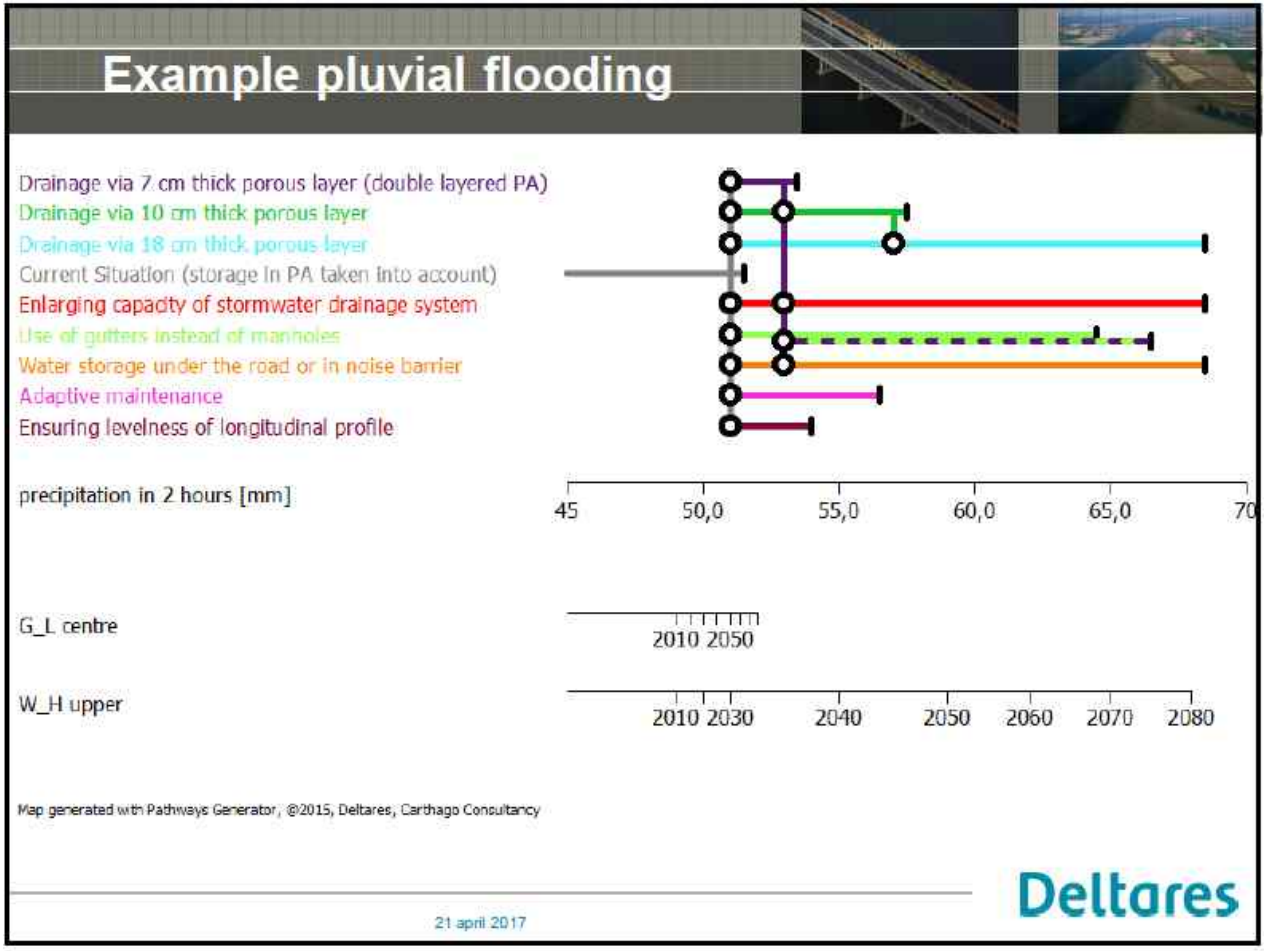
to use risk and vulnerability assessment tools in such a way that the most cost effective approach is achieved, both short and long term, resulting in a climate and extreme weather resilient highway

ROADAPT method to develop climate adaptation strategy

	ROADAPT step	
1	Quick Scan	2 workshops: 1. to determine climate threats for the A58 infrastructure and the surrounding environment 2. to determine key risks and potential measures
2	Vulnerability Assessment	GIS methodology with several steps to determine vulnerabilities in the road network. The output consists of maps with these vulnerabilities.
3	Socio-economic Assessment	2 methods: - Cost Effectiveness Analysis - Cost Benefit Analysis
4	Adaptation Strategy	Dynamic adaptation pathways to determine an adaptation strategy

Potentially vulnerable locations for pluvial flooding

Dynamic Adaptation pathways



Potential measures for the A58

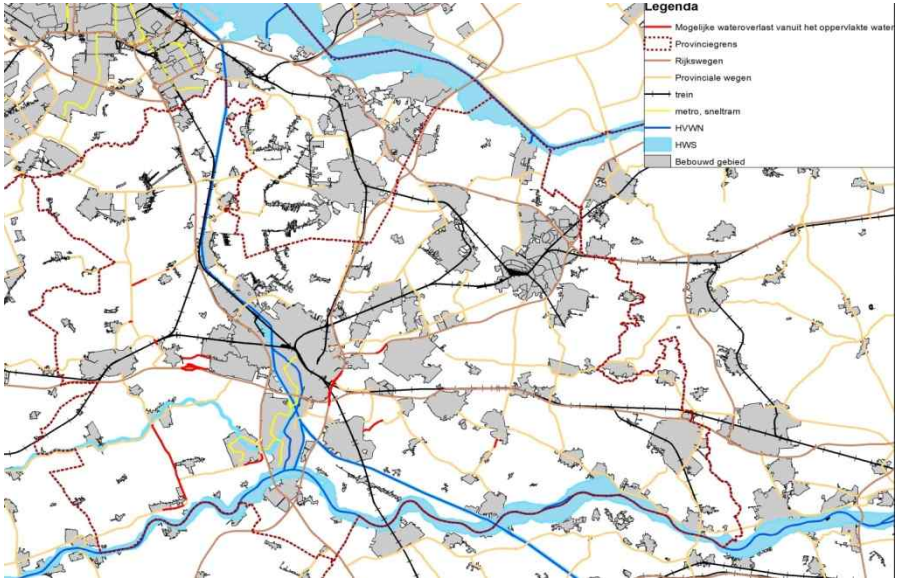
Measures that are identified (amongst others) are :

- Culverts - increasing capacity by enlarging the culverts or intensifying maintenance, as well as upstream water retention
- Increasing inclination of the road
- Increasing the thickness of the asphalt (can be done every 10 years, during replacement of the asphalt)
- Realization of water retention, adjacent to the road
- Elevating the road

Assessing regional vulnerability

Area oriented approach in Utrecht , like with InnovA58, together with municipalities, water boards, province

Pluvial flooding affecting roads (HDSR water board map)



Conclusion

- Multiple tools, methods and examples available, and are developed , e.g. within CEDR program, and on a National level in The Netherlands
- Cost effectiveness and coupling with assetmanagement is an important step, basis for decision making
- Hard work to make it part of the normal process and policy – we are making progress
- Adaptation and resiliency often mean: short term costs, long term benefits. Requires long term thinking and strong and visionary leadership