New investments and sustainability of the road network:

Integrating climate change into roads management

Pasquale Staffini

Warsaw, 4th December 2019

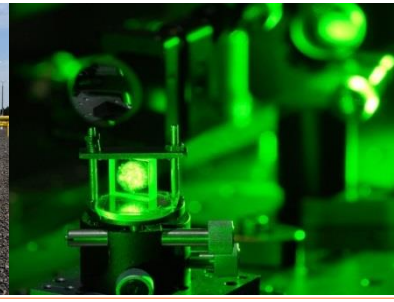
Jaspers
Joint Assistance to Support Projects in European Regions

Joint Assistance to Support Projects in European Regions

- Technical assistance partnership between the European Commission (EC) and the European Investment Bank (EIB).
- JASPERS helps EU and Pre-Accession Countries prepare high-quality investment projects to benefit from European funds.
- Around 130 experts providing support to projects in a range of sectors (Transport, Water and Wastewater, Energy and Solid Waste and Smart Development).
- Provide advice at all stages of the project development cycle, including advice on climate change, to support the development of sustainable, low carbon and climate resilient projects and programmes.



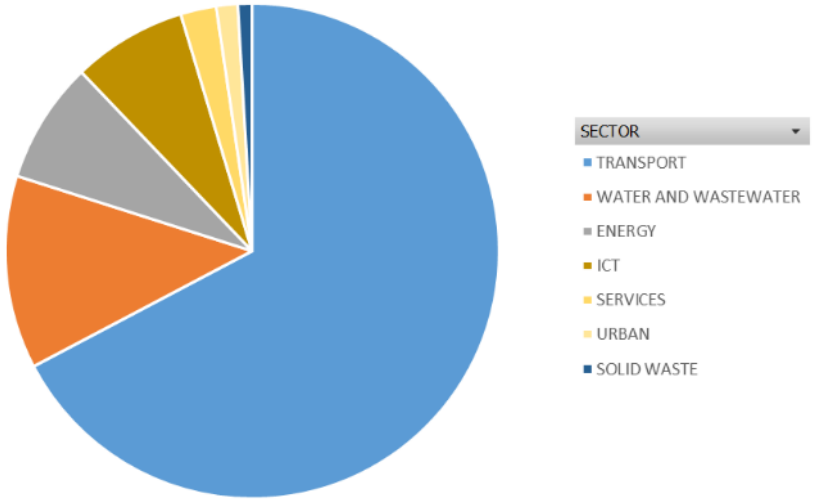




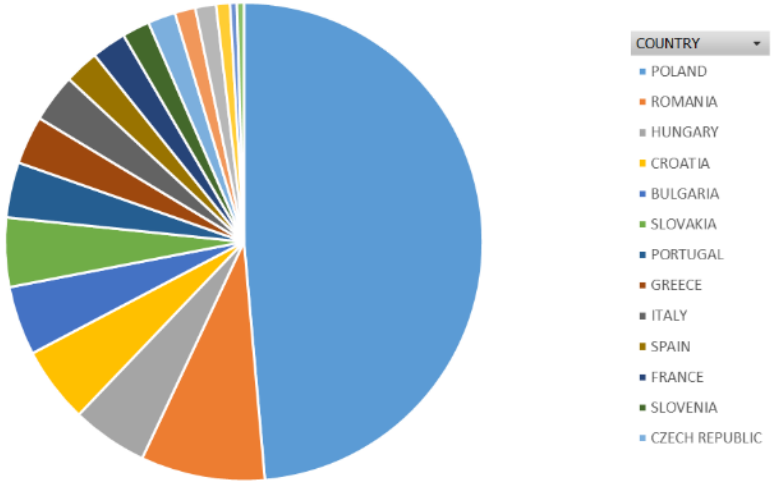
Approved Projects

JASPERS Experience

Sector



Country



182 major projects approved by EC in 2014-2020 MFF

*(Total investment cost: **€57bn**)*

(*) Data at 3rd quarter 2019.

Turning policies into projects

Cascading down EU objectives and requirements into specific advice to roads authorities, in particular for:

- Actual implementation of EU strategies on the ground
- Strategic planning and option analysis
- Preparation and management of pipelines of projects
- Composing appropriate sets of measures and optimising overall investments
- Focusing on those schemes, which have the best fit with strategic objectives and highest economic returns
- Effective use of funds

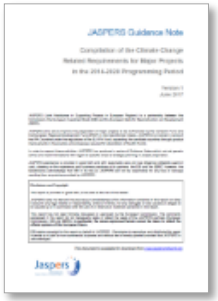
Lights and Shadows

- A vital element of regional and urban infrastructure
- A major threat from an environmental and social viewpoint
- Modal split continues tilting towards roads
- Pressure to build and expand roads remains high
- Increasingly restricted and restrictive environment
- Traffic gridlock, land take, emissions, road safety issues, climate change risks
- Significant continuous operating and maintenance expenditure

Sustainability

Climate Change and Roads

- Roads at the heart of Climate debate
- 2014 – 2020 is first EU progr. period requiring to include climate change
- Mainstream climate action at all project stages
- Climate change mitigation from strategy level and project preparation
- Methodological advice on GHG emissions calculations
- Climate change vulnerability and risk assessment to identify to ensure resilience



JASPERS Guidance Note: Compilation of Climate Change Related Requirements (Networking Platform Website)

JASPERS Guidance – The Basics of Climate Change Adaptation Vulnerability and Risk Assessment (Networking Platform Website)

JASPERS Guidance – The Basics of Climate Change Adaptation Vulnerability and Risk *Polish version (Networking Platform Website)*

JASPERS Brochure - Roads and Climate Change (JASPERS Website)

Climate Change and Roads

- 27% of GHG emissions in Europe come from transport (incl. aviation & shipping), from which roads accounts 72%
- Climate hazards impact transport networks with short and long term effects (economic impacts)

Poland (2017): transport sector accounts for 15.3% of total GHG emissions

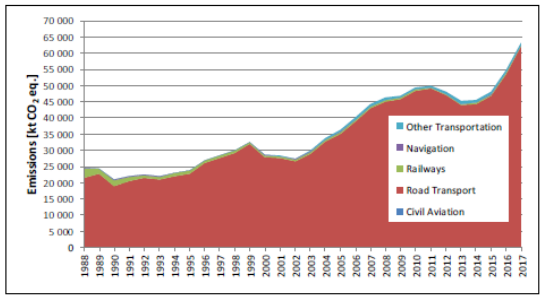


Figure 3.2.8.1. Emissions from transport in years 1988-2017

- Integrate climate change into management and development of transport networks (mitigation and adaptation from early planning stages to operation)
- Alignment with decarbonisation strategies/emissions pathways

New investments and sustainability of the network

Ensuring climate resilience

- Road engineering design standards have always integrated climate considerations
  - ✓ Poland: Bridges design return period was changed after "Millennium Floods" (i.e. adaptation measure at that time)
  - ✓ Scotland roads: surface drainage + 20% increase in rainfall intensity of design storm

- Maintenance needs to constantly respond to current climate impacts
  - ✓ Use and constant review of design standards
  - ✓ User warning systems
  - ✓ Register and monitoring of events
  - ✓ …

Sufficient to BE RESILIENT to NEXT EVENT?

Integrating climate change into roads management

A good road asset management system…

- Monitoring performance of assets
- Reporting on current and predict future network condition
- Deciding on future maintenance strategies and interventions

Climate Change impacts need to be considered and integrated

- Understanding climate change impacts on roads
- Analysing vulnerability and identifying risks to climate change
- Define adaptation measures

Integrating climate change into roads management

Data

- Registers & monitoring of weather related events
- Climate change forecasts: regionalised, relevant variables
- GIS is fundamental tool

Vulnerability and Risk Analysis

- Define criticality levels of infrastructure
- Mapping and characterization of causes of historical performance impacts (infrastructure damages, road user impacts, road operation impacts, etc.)
- Understanding potential future impacts
- Identification of risks – definition of levels of service

Institutional

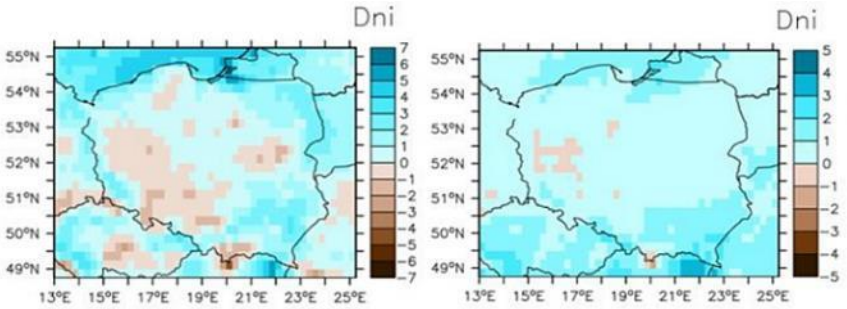
- Continuous process – increase awareness at all organisational levels
- Cooperation and exchange between different units and authorities
- Knowledge sharing and exchange

CLIMATE CHANGE ADAPTATION/RESILIENCE PLAN

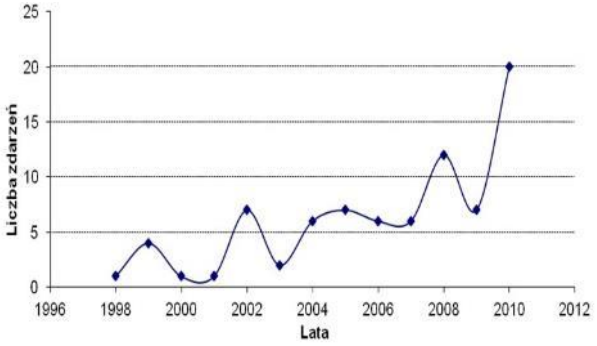
Climate change data

Forecasts, registers…

- Regional climate change forecasts



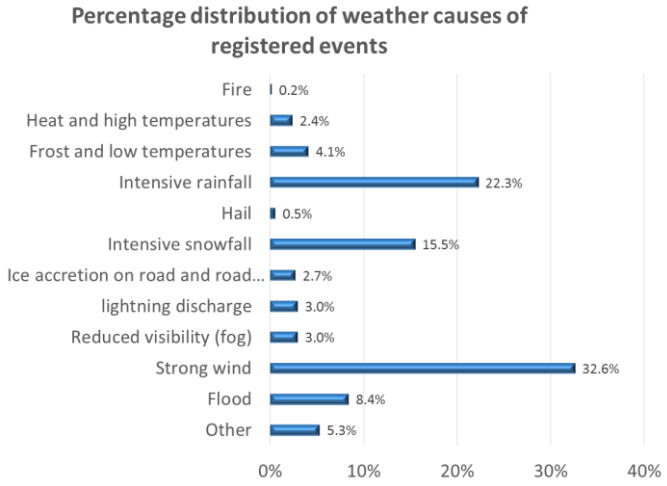
Difference in days with P>10 mm/day (left) and P>20 mm/day (right) between 1971-2000 and 2041-2070.
Source: KLIMADA.

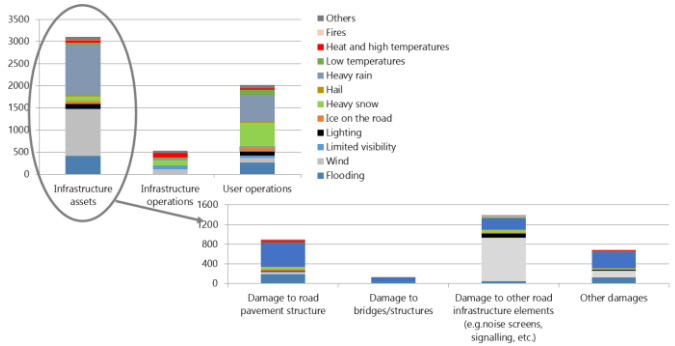


Incidents (yearly number) of whirlwinds in Poland.
Source: IMGW.

KLIMADA 2.0 project by IOŚ-PIB to provide easy access to climate change scenarios and climate data

- Registers





Source: Climate Change Adaptation for National Roads in Poland project, GDDKiA.

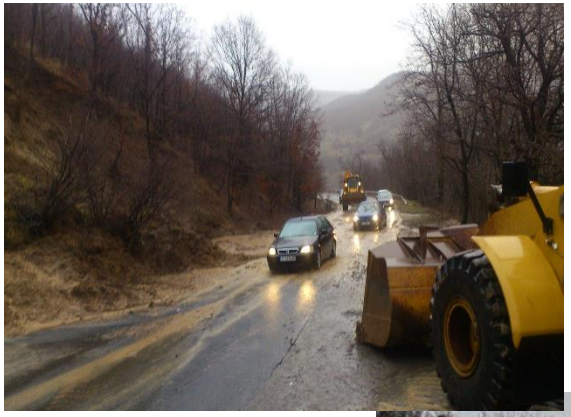
Climate change vulnerability and risk analysis

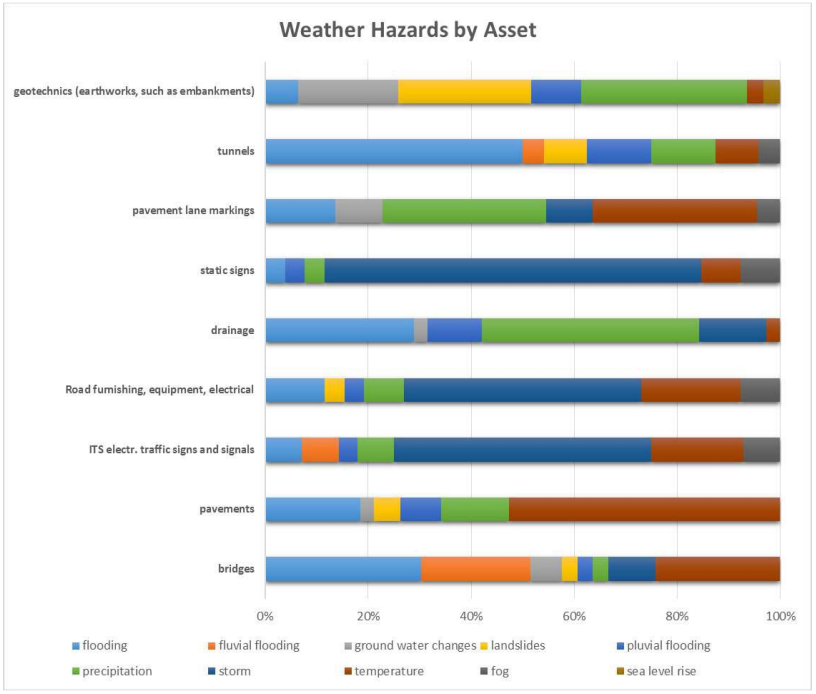
How does climate impact road infrastructure?

	Examples of possible impacts
Heavy precipitations	• damage to road assets (pavements, earthworks and structures) and drainage systems; • increased runoff to / from adjacent land causing flooding; • inundation from adjacent watercourses; • increased slope instability and landslides; • increased scouring impact on road bridges (both abutments and intermediate supports); • deterioration of structural integrity of road structure due to increase in soil moisture levels; • reduced visibility; • hazardous pavement surface conditions (skidding, water ponding etc.).
Extreme temperatures (heatwaves)	• pavement surface damage (e.g. softening, cracking, rutting, sweating, blown-ups etc.); • problems with bridges (stability, thermal expansion at bridge joints….); • increased risk of fires; • health and safety risks to road users (e.g. brake failure) including accidents and vehicle damage (possibly casualties and injuries) and to employees of road operators; • traffic disturbance/congestion.
Cold spells	• damage to pavement surface and equipment; • reduced pavement deterioration due to lower exposure to freezing, snow and ice (positive impact); • increased winter maintenance costs; • negative thermal expansion at bridges; • increased safety risks to users and operators; • traffic disturbance/congestion.

Climate change vulnerability and risk analysis

How does climate impact road infrastructure?



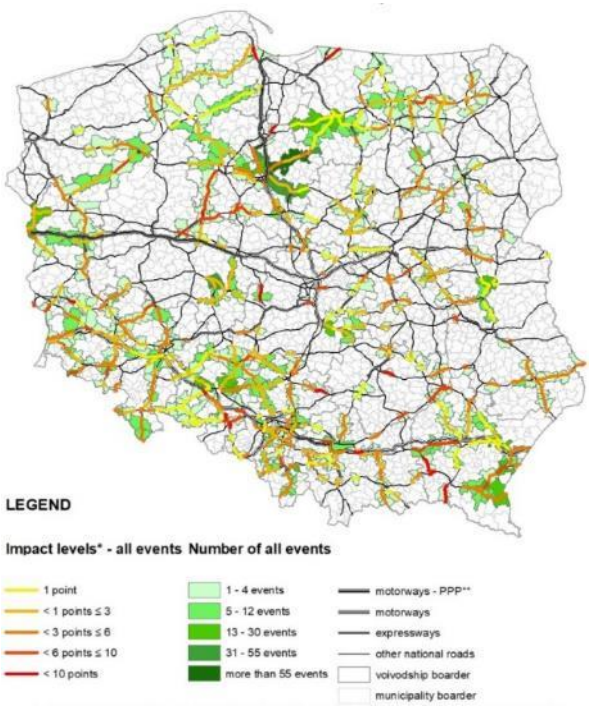


Source: "DeTECToR Initial Findings", extract from presentation held on 4th April 2017.

Most climate change impacts during road operation

Case: the Polish example

"Adaptation to Climate Change for National Roads in Poland"

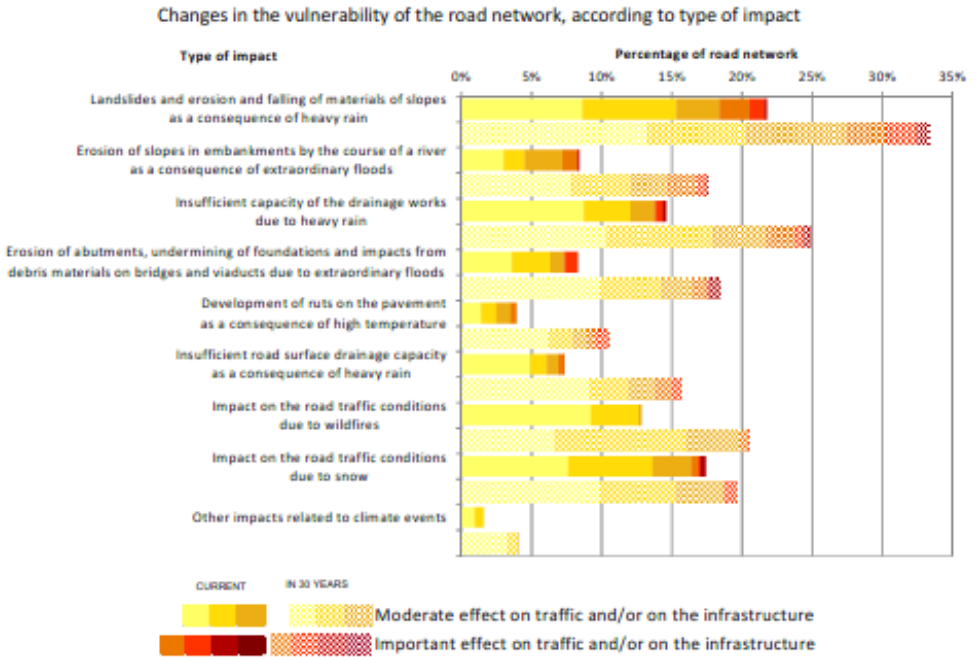


Source: Adaptation to Climate Change for National Roads in Poland, GDDKiA. Brussels, June 2019

- Database of extreme weather events and impacts affecting national road network (>3,000 over recent 12 years)
- Mapping current climate vulnerabilities i.e. exposure (No of events) and sensitivity (damages, traffic disruptions)
- Using climate forecasts, current registers impacts & expert ground knowledge to assess future vulnerabilities
- Basis to draw "Business case" & Adaptation Action Plan
- Raising awareness and institutional capacity strengthening

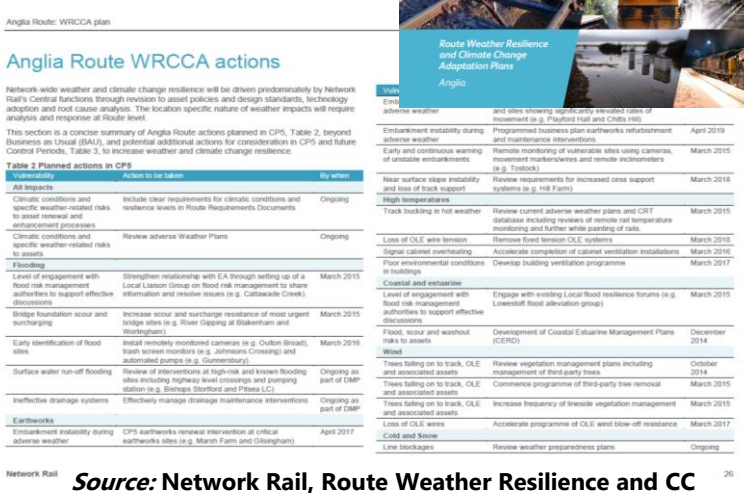
Other examples

Vulnerability assessment of the national road network in Spain



Source: **"Sections of the state-owned inland transport infrastructure network that merit prior attention because of climate variability and change", 2018. Presentation at [Second JASPERS Climate Change Adaptation in Transport workshop], June 2019.**

Climate Adaptation Plan Network Rail


Anglia Route: WRCCA plan

Anglia Route WRCCA actions

Network-wide weather and climate change resilience will be driven predominately by Network Rail's Central functions through revision to asset policies and design standards, technology adoption and root cause analysis. The location specific nature of weather impacts will require analysis and response at Route level.

This section is a concise summary of Anglia Route actions planned in CP5, Table 2, beyond Business as Usual (BAU), and potential additional actions for consideration in CP5 and future Control Periods, Table 3, to increase weather and climate change resilience.

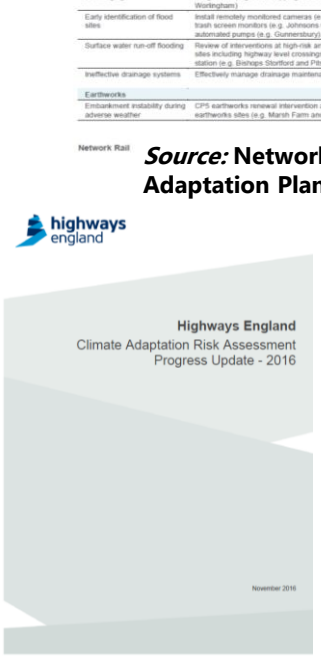
Table 2 Planned actions in CP5

Vulnerability	Action to be taken	By when
All Impacts		
Climatic conditions and specific weather-related risks to asset renewal and enhancement processes	Include clear requirements for climatic conditions and resilience levels in Route Requirements Documents	Ongoing
Climatic conditions and specific weather-related risks to assets	Review adverse Weather Plans	Ongoing
Flooding		
Level of engagement with flood risk management authorities to support effective discussions	Strengthen relationship with EA through setting up of a Local Liaison Group on flood risk management to share information and resolve issues (e.g. Cattawade Creek).	March 2015
Bridge foundation scour and surcharging	Increase scour and surcharge resistance of most urgent bridge sites (e.g. River Gipping at Blakenham and Workingham)	March 2015
Early identification of flood sites	Install remotely monitored cameras (e.g. Oulton Broad), trash screen monitors (e.g. Johnsons Crossing) and automated pumps (e.g. Gunnersbury).	March 2016
Surface water run-off flooding	Review of interventions at high-risk and known flooding sites including highway level crossings and pumping station (e.g. Bishops Stortford and Pitsea LC)	Ongoing as part of DMP
Ineffective drainage systems	Effectively manage drainage maintenance interventions	Ongoing as part of DMP
Earthworks		
Embankment instability during adverse weather	CP5 earthworks renewal intervention at critical earthworks sites (e.g. Marsh Farm and Gilsingham)	April 2017

Network Rail

26

Source: **Network Rail, Route Weather Resilience and CC Adaptation Plans Anglia, [Route WRCCA Plans 2014-19]**



Climate Adaptation Risk Assessment Review - Highways England

More information:

http://jaspers.eib.org/