

Second workshop on **Climate Change Adaptation in the Transport Sector**

Experience from Project Preparation and
Network Management

6th June 2019, Brussels

Agenda

- 9:30 Opening and Welcome, plus Introductions
- 10:00 **Session 1 – Experience of analysing climate change vulnerability and risks for transport projects**
- 13:00 *Networking lunch*
- 14:00 Briefing on discussion outcomes
- 14:30 **Session 2 – Integrating climate change in transport networks management**
- 16:00 Conclusions and next steps
- 16:30 *Close*

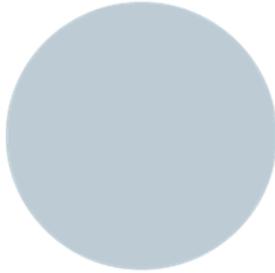
(approx.)





- **Introduction**
 - **JASPERS**
 - **Climate change requirements**
 - **JASPERS advice and workshops**
 - **Climate change and transport**

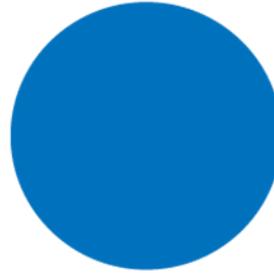
JASPERS Roles in 2014-2020



Project preparation

Hands-on advice and guidance in the preparation of projects, with upstream involvement.

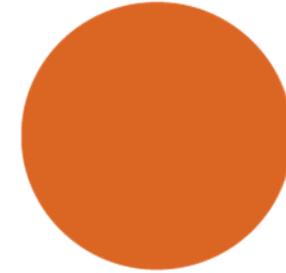
Supporting the integration of climate change considerations into project development



IQR

Appraisal of projects submitted for EU Funding, providing opinions as to whether projects qualify for grants or not.

Review and approval process includes climate change related requirements.



Capacity building

Consolidation of the transfer of knowledge carried out during project assignments, with workshops and training courses.

We also publish working papers to disseminate best practices and address common issues encountered during project preparation.

- **Networking Platform EU-level (multi-country) capacity building**, training, knowledge sharing, dissemination of good practice (in Brussels and at regional level)
 - Focus on key competencies for cohesion policy, good practice for project preparation and other relevant horizontal/ sectoral topics
- **In-country capacity building actions**
 - requested by MSs for targeted capacity building assignments (including train-the-trainers)
 - follow-up of multi-country and contribution to other JASPERS actions
- **Advisory on horizontal issues** - State aid, climate change, PPPs, CBA, environmental issues, etc.
- **Videos and e-learning** (blended training)
- **Publications** and guidance documents
- **Web portal:** www.jaspersnetwork.org



Workshop

- [Knowledge sharing event Climate Change Adaptation in the Transport Sector – Experience from Project Preparation and Network Management, Brussels, December 2017](#)

Agenda

- 9:00 Opening and Welcome, plus Introductions
- 09:15 **Session 1 – Analysis of Climate Vulnerabilities on Transport Networks**
- 12:00 *Lunch*
- 13:00 **Session 2 – Assessment of Climate Risks for New Projects**
- 15:15 *Break*
- 15:30 **Session 3 – Awareness Raising and Information Sharing Within and Between Countries**
- 16:30 Conclusions
- 16:45 *Close*

CLIMATE CHANGE ADAPTATION IN THE TRANSPORT SECTOR – EXPERIENCE FROM PROJECT PREPARATION AND NETWORK MANAGEMENT



A knowledge sharing seminar on climate change adaptation in the transport sector was held in Brussels on 6 December 2017.



The JASPERS leadership Platform was created to coordinate JASPERS project delivery operations by representing knowledge sharing and capacity building activities, as well as facilitating identification of project proposals and sharing of information among all JASPERS project delivery organisations and other JASPERS stakeholders.

The JASPERS CO Hubworking Platform is open to all JASPERS and non-JASPERS COs.

For more information on previous JASPERS Platform events see [the JASPERS Platform website](#).

Venue Map



The final agenda, the presentation delivered and a detailed overview of the seminar are available for downloading here.

Details agenda JASPERS NP Event COC Adaptation Transport - Brussels, 6 December 2017

Summary of JASPERS Platform seminar on Climate change and transport - 6 December 2017

CONTACTS

JASPERS on Climate Change Adaptation in



Best Practice Case Studies

- Identifying the climate change hotspots in the Spanish State-owned inland transport network
Albert Compte Anguela – CEDEX, Spain
- Mapping climate vulnerabilities on existing national road network in Poland
Grzegorz Łutczyk – GDDKiA, Poland
- Adapting Transport Authorities to Climate Change Adaptation
Rui Velasco Martins -Instituto de Movilidade e dos Transportes, Portugal
- Assessment of risks for highways in the Netherlands due to Climate Change
Kees van Muiswinkel – Ministry of Infrastructure and Water Management, Netherlands

- Climate Change and the Norwegian Road Network
Martine Holm Frekhaug – NPRA, Norwegian road authority, Norway
- Increasing Transport Resilience: The ROADADAPT framework in practice
Mike Woning – Deltares
- Climate change vulnerability and risk assessment on Gradiška Bridge
Boris Majić –Hrvatske ceste, Croatian Roads, Croatia

Climate Change Adaptation in the Transport Sector

Experiences from Project Preparation and Network Management

JASPERS Platform Seminar on Climate Change Adaptation in the Transport Sector, Brussels, 6 December 2017



European Structural and Investment Funds (ESIF)

- 2014-2020 is the first programming period when climate considerations are included in the preparation and implementation of programmes and projects:
 - "Climate action objectives will represent at least 20% of EU spending";
 - Mitigation and adaptation are an integral part of sustainable development.

- Legal Basis:

Common Provisions Regulation (EU)
No 1303/2013

Commission Delegated Regulation (EU)
No 480/2014

Commission Implementing Regulation
(EU) No 1011/2014

Commission Implementing Regulation
(EU) No 2015/207

- The Common Provisions Regulation (CPR) lays down a single set of rules covering the EU's five Structural and Investment Funds (the ESI Funds). Includes CC in Article 101.
- Annex II of CDR (EU) No 480/2014 sets the quality review criteria against which the information provided on a major project is assessed. Criterion 6.1 covers CC.
- Annex I, Part B of CIR (EU) No 1011/2014 sets the format for the Independent Quality Review (IQR) Report. Criterion 7.2 covers CC.
- CIR 2015/207 lays down detailed rules implementing Regulation (EU) No 1303/2013. This includes the format for submission of the information on a Major Project in Annex II (specifically sections D.2, D.3, E.2, E.3 F.1 and F.8 refer to climate change) and the methodology for carrying out the cost-benefit analysis in Annex III (specifically sections 2.1.4, 2.3.3 and 2.4 refer to climate change).

Climate Change Requirements

Three Focus Areas

1. Consistency with Climate Policy

- EU 2020 Strategy Targets
- National and/or Regional Adaptation Strategy
- Climate Financing

2. Evaluation of GHG Emissions / Carbon Footprint

- How was it undertaken / Methodology
- What were the results / Footprint and cost

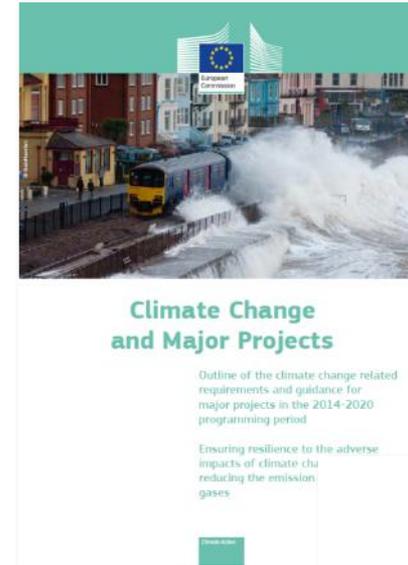
3. Adaptation Vulnerability and Risk Assessment

- How was it undertaken / Methodology
- What were the results / Adaptation Measures

• The requirements are clearly described in the following 2 Guidance Documents:

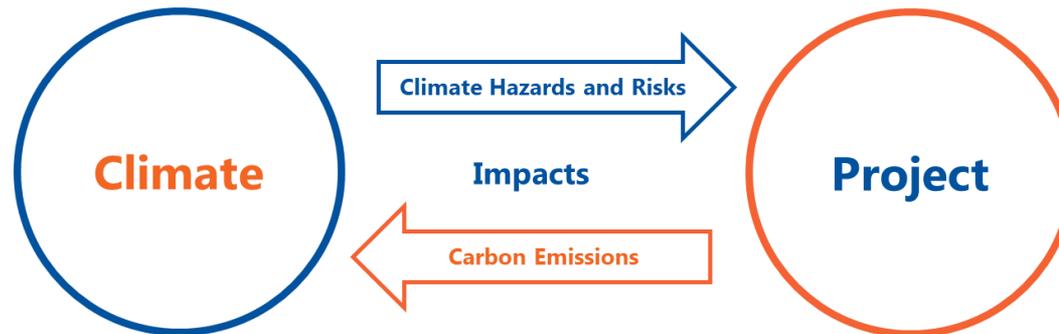
DG CLIMA Publication: [Climate Change and Major Projects](#)

JASPERS Guidance Note: [Compilation of the Climate Change Related Requirements for Major Projects in the 2014-2020 Programming Period](#)



JASPERS Climate Change Advice

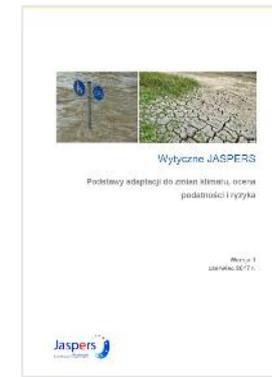
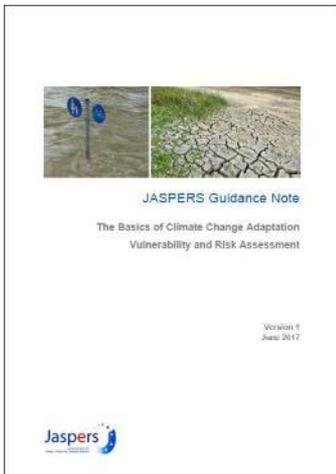
- **Mainstream climate action** into Major Projects applying for EU Structural Funds
- Consider climate change **at all stages of project** – strategy, development, approval, implementation, operation
- Project specific advice and targeted capacity building



- **Adaptation** – The area of greatest uncertainty for project applicants. JASPERS assistance (both hands-on project specific support and more horizontal capacity building) has therefore focused more on this topic. There has been a significant improvement in knowledge and understanding of the topic since the start of the programming period.

Adaptation Vulnerability and Risk Assessment

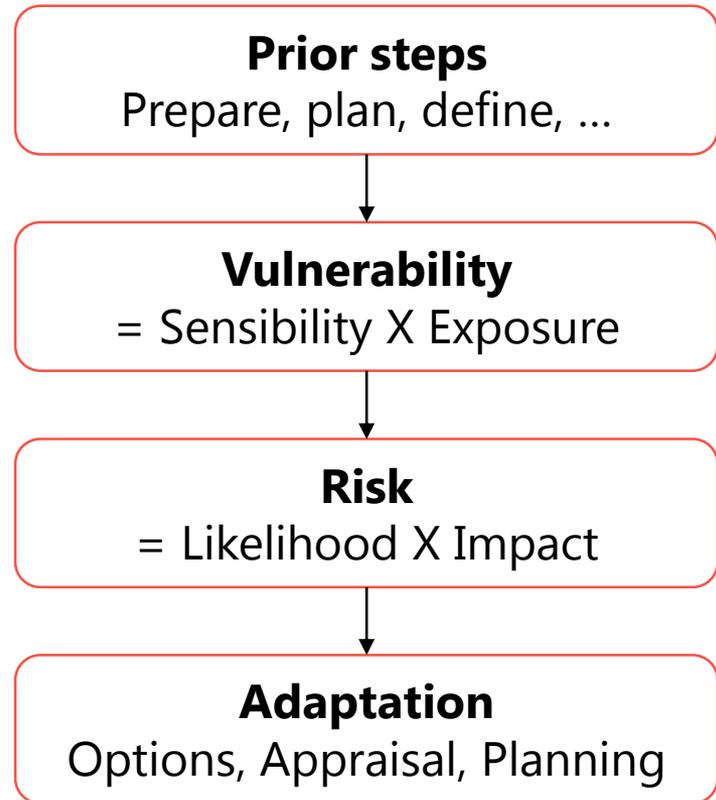
- Process of managing climate risks
 - Identify which climate hazards the project is vulnerable to, assess the level of risk and integrate adaptation measures to reduce that risk to an acceptable level
 - Cover current climate variability and future climate change
 - Ensure climate risks considered as part of general risk assessment
- [JASPERS Guidance – The Basics of Climate Change Adaptation Vulnerability and Risk Assessment](#)



[Polish version](#)

Vulnerability and Risk Assessment - Key Principles

- Integrated approach - climate risks are part of the risk assessment, and considered throughout;
- Promoting assessment as early as possible;
- Based on sound data (historical trends plus forecasts and projections);
- Current climate variability and future climate change;
- Significant risks need to be addressed with relevant adaptation measures that can be structural or non-structural;
- Many different methods of assessment, key is to demonstrate clear logic.



Climate Change and Transport

- Over 20% of GHG emissions in Europe come from the transport sector, the second largest producer after energy.
- Climate hazards impact critical infrastructure; strongest increase in damage is projected for energy and transport.
- Short and long term effects (beyond the sector – economic impacts): increased infrastructure damage and operational costs, longer users delays, disruptions, safety risks.



Sokolniki (Poland, June 2010). Source: "Raport o stanie środowiska w 2010 r."

National impacts Flood 2010:

- 266,000 people affected including 31,000 people evacuated. Damage reported at 1,387 enterprises
- 683,000 ha flooded and more than 18,000 of buildings
- 148 km of railway out of operation
- 1,690 km of roads...



Toyota produced 500.000 less vehicles than planned and quarterly profit shrank by 75% following the tsunami in Japan 2011



Porsche befell a production loss of 450 cars per day, due to a flood in Slovakia which blocked car bodies from being transported to the assembly factory in Germany

Source: Presentation "DHL Resilience360
- An innovative approach of managing of Weather Incidents in logistics".

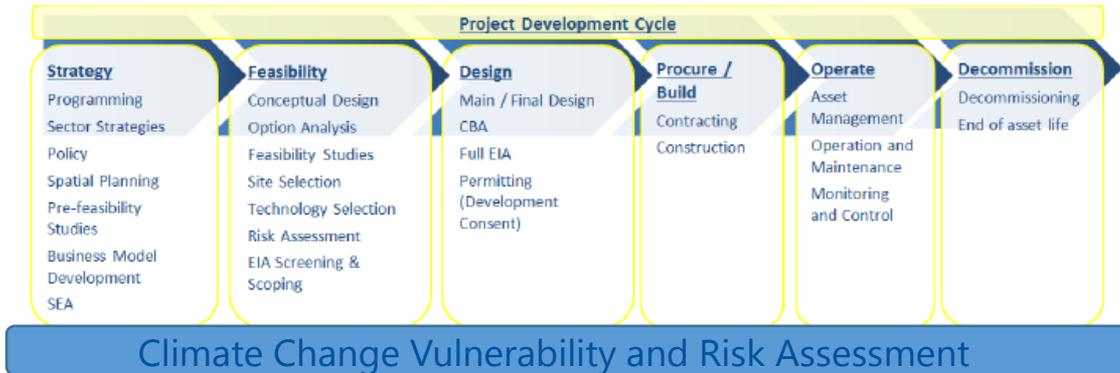
Mitigation Actions

- How to reduce or prevent emissions of GHGs in the transport sector...
 - Strategic Planning (national, regional and local mobility / transport plans) – with a focus on modal shift to more sustainable modes;
 - Demand management – reducing the need to travel;
 - Improvements in energy efficiency (improved rolling stock fleet) and the efficiency of the transport system (including making the most of digital technologies, etc.);
 - Use of renewable energy and low carbon fuels – such as advanced biofuels, electricity, hydrogen and renewable synthetic fuels;
 - Option Analysis – e.g. corridor route option analysis or technology selection. Using carbon footprinting at option analysis stage to identify low carbon options.
- > methodologies to extend the carbon footprint calculation to a network.

CC Mitigation in transport mainly happens/starts at the Plan level not with the single Project!

Adaptation Actions

- How to make transport infrastructure more resilient to climate change and its impacts.....



- Strategy/planning, pre-feasibility studies & options analysis – consider project location vulnerability
- Vulnerability assessments at project design to ensure risks at “acceptable level”
 - Transport infrastructure components have very long life – design characteristics should consider expected future climate conditions
- Maintenance is indispensable to ensure transport infrastructure sustainability and services – need to consider climate risks
- Transport operations – foresee efficient monitoring, incident register and user warning systems

Related types of JASPERS support

Transport and mobility planning

Support on preparation of strategies and plans (including ToR advice)

Project preparation support

Advice on ToR preparation, project development technical advice/support

Capacity building

Regular project “hands-on” support, horizontal assignments (e.g. climate change integration at transport network management), international workshops/seminars, country trainings



Climate change vulnerability and risk assessment

Guidance, methodological and technical support, advice at different project preparation stages

Experience of analysing climate change vulnerability and risks for transport projects



- **Some outcomes from the first workshop**
- **Best Practice Case Studies**

Project level analysis – some main outcomes

- Broad differences among countries on integrating climate change adaptation into planning and projects development. “More needs to be done” to be integrated into ALL stages (i.e. planning or O&M).
- Availability of adequate input data is crucial (e.g. good quality adaptation strategies, network level analysis, data monitoring register).
- Uncertainty is difficult to manage at the design stage. Some “no-regret” adaptation measures at the O&M stage, cost-effective solutions, adaptation pathways.
- Further more precise guidance and examples sharing are needed.
- Further platform exchanges on climate change adaptation in transport as well as country level training needed.

Experience of analysing climate change vulnerability and risks for transport projects

- Climate change vulnerability and risk assessment for Linha do Minho railway project

Paulo Soares de Melo - Infraestructuras de Portugal, Portugal

- Studies on climate change and risk assessment for two high speed rail lines under construction in Spain

Violeta Gonzalez Aleñar - ADIF, Spanish Railway Manager, Spain

- Climate change impact assessment on Rail Baltica

Antti Roose - Tartu Regional Energy Agency, Estonia

Experience of analysing climate change vulnerability and risks for transport projects



- **JASPERS: Reflections on experience and lessons learnt**
 - JASPERS IQR Findings
 - JASPERS Advisory: reflections, technical issues and challenges
- **Break-out discussions and briefings**

JASPERS IQR Findings

JASPERS Networking Platform
**Second workshop on Climate Change Adaptation in the
Transport Sector**

Aušra Jurkevičiūtė

Checklist

Contribution to Policy Objectives	<ol style="list-style-type: none">1. <i>Information is provided regarding the national Climate Change targets of the EU 2020 Strategy and/or any other relevant Climate Change policies and objectives, and the projects contribution towards them stated where relevant;</i>2. <i>Information is provided regarding the national adaptation strategy, and the projects contribution towards it stated where relevant;</i>3. <i>Correct intervention field according to Implementing Regulation (EU) No 215/2014 is assigned to the project and the EU contribution to the project costs aimed at Climate Change (% and EUR) is calculated;</i>
Mitigation	<ol style="list-style-type: none">4. <i>The GHG emissions of the project have been calculated in accordance with a recognised methodology;</i>
Adaptation	<ol style="list-style-type: none">5. <i>Sufficient information is presented on when and how Climate Change was taken into account in the project preparation process. Sufficient information on relevant Climate Change factors, project vulnerability, current and future risk, identification and assessment of measures, and climate forecasts is provided; and</i>6. <i>Sufficient information is provided on relevant measures implemented or foreseen to ensure resilience of the project to climate change variability, where significant risks were identified.</i>

- The simplest exercise was the attribution of the category to the project with a defined code/% of EU expenditure (contribution) to the Climate Action.
- Knowledge of the relevant Climate Change policies and objectives, notably adaptation strategic documents on the national level and linking them to the project (contribution) was found weak.
- **A substantial progress has been observed in the quality and the depth of Climate change adaptation vulnerability and risk assessments performed.** DG CLIMA, JASPERS Advisory and JASPERS Guidance (2017) played a big role.
- Updated EIA Directive enabled newer projects to incorporate the Climate change adaptation vulnerability and risk assessments into EIAs (as of 2017).
- **The integration of Climate Change into option analysis** was found lacking almost in all projects reviewed, since they have been based on historical option analysis.

Progress and next steps

- **Training and horizontal activities** can play a significant role when it comes to building capacity and promoting the independence of project promoters on the topic (national/European level).
- **Project alignment with climate policy objectives and targets** is an area which is frequently weakly described. More awareness on main documentation and plans at national/local level would be necessary.
- **Embedding Climate Change considerations in the option analysis remains** as an area for significant improvement, where efforts should be focused in the coming years.
- **Climate Change Adaptation, Vulnerability and Risk Assessments are prepared for most projects**, but with different level of analysis. This has to become a standard part of risk analysis.

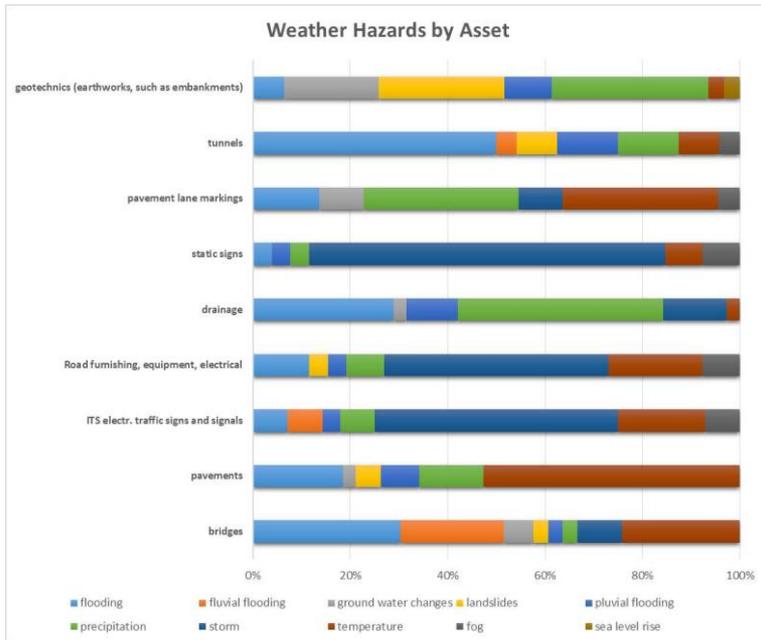
JASPERS Advisory: Reflections, technical considerations and challenges

JASPERS Networking Platform
**Second workshop on Climate Change Adaptation in the Transport
Sector**

Marian Purtz, Elisabet Vila Jordà

Technical considerations for CCVRA

How is road infrastructure expected to be affected?



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

National platforms with climate change scenarios dissemination functions for a diversified user community and sectors

The screenshot shows the 'Portal do Klimy' website interface. It features a navigation menu with options like 'CLIMATE', 'COMPARISON', 'DOWNLOAD', 'STATIONS', and 'HELP'. The main content area displays a map of Portugal with a climate data overlay. To the right, there are two line graphs: 'Mean Temperature' for the period 1971-2000 (Mantland) and 'Annual Evolution 1971-2000, Mantland'. The bottom of the page includes logos for IPMA, Fundusze Europejskie, Rząd Republiki Polskiej, IOŚ-PIB, and Unia Europejska.

Source: Portal do Klimy

Source: Klimada 2.0, IOŚ.

Climate related hazards impacting transport projects

- Incremental air temperature increase
- Extreme temperature increase and Heatwaves
- Incremental rainfall change
- Extreme rainfall change
- Water availability
- Water temperature
- Flooding (coastal and fluvial)
- Seawater temperature
- Relative sea level rise
- Storm surges
- Saline intrusion
- Ocean salinity
- Ocean pH
- Coastal erosion
- Soil erosion
- Ground instability/ landslides/ avalanche
- Soil salinity
- Average wind speed

Examples of hazards affecting a road project	
Extreme temperature increase (including heat waves)	Changes in the frequency and intensity of extreme temperatures periods (both maximum and minimum) and heat waves
Cold spells	Prolonged periods of extremely cold temperatures
Change in average rainfall	Trends over time of either more or less precipitation (rain, snow, hail, etc.)
Change in extreme rainfall	Changes in the frequency and intensity of periods of intense precipitation
Snow	Changes in the frequency / intensity of periods of intense snow precipitation
Fog	Changes in the frequency and intensity of periods of intense fog
Maximum wind speed	Increases in the maximum force of gusts of wind
Freeze-thaw cycle	Repeated freezing and thawing may cause stress damage to materials/structures
Flooding (coastal/fluvial)	Flooding from the sea or from rivers
Soil erosion	The process of removal and transport of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, winds and underground water
Ground instability/ landslides/ avalanche	Ground instability: movement of the ground. Landslide: A mass of material that has slipped downhill by gravity, often assisted by water when the material is saturated. Avalanche: a rapid flow of snow down a sloping surface
Wild fires	Unwanted, unplanned and damaging fires such as forest fires and fires of shrub and grasslands

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.

How does climate change impact road infrastructure?



Examples of adaptation measures - part 1

Climate risks and hazards	Potential adaptation approaches for road projects
<p>Extreme precipitation and flooding</p> <p>Landslides</p>	<p>Planning</p> <ul style="list-style-type: none"> ✓ Road alignment considerations (both vertical and horizontal); ✓ Run-off water management analysis; River basin management plans; ✓ Consideration of maintenance implications. <p>Design and construction</p> <ul style="list-style-type: none"> ✓ Drainage system type and capacity (ensuring sufficient & efficient drainage system is crucial for dealing with extreme precipitation hazards); ✓ Bridge foundations design and erosion protection (e.g. avoid intermediate bridge supports in fast-flowing currents that could be vulnerable to scour); ✓ Review design standards and guidelines (review design intensity and frequency values or consider a climate change factors e.g. 10-20% increase in drainage capacity or increased clearance over 50-(100 or 200?) year flood levels under bridges); ✓ Other road design considerations: reducing slope gradients, slope consolidation & embankment protection measures, slope drainage, stronger pavements etc. <p>Maintenance and operation</p> <ul style="list-style-type: none"> ✓ Review O&M practices for drainage systems and slopes (including regular inspections); ✓ Consider CC aspects within O&M contracts; ✓ Use of asset management and traffic management systems to record and monitor asset condition and to provide timely information and warning to asset managers and users; ✓ Prepare and plan for rapid response during extreme situations (e.g. Disaster Risk Management Plan) and use adequate emergency warning systems.

Examples of adaptation measures - part 2



Observed good practices worth considering

Institutional & enabling environment

- ✓ Continuous process – increase awareness of CC at all organisational levels
- ✓ Requires cooperation and exchange between different units and different authorities (e.g. design and maintenance units, meteorological institute, water authority etc.)
- ✓ Multi-disciplinary teamwork lead by technical experts (i.e. generally engineers)
- ✓ Knowledge sharing and exchange

Data & Analysis

- ✓ Climate projections availability (level of detail and area specific)
- ✓ GIS supported analysis is a key
- ✓ Use of data monitoring registers or other local information sources
- ✓ Integrate climate change adaptation into the project development cycle as early as possible

Delivery and resilient solutions

- ✓ Early considerations of project location and technical solutions impact
- ✓ O&M measures are very important
- ✓ Cost-effectiveness of measures and accepted performance levels of so
- ✓ Vulnerability assessments of national networks

Climate change adaptation needs to be a part of the overall transport infrastructure management!



Current and future challenges: from a requirement to a good project development practice

- Planning and (pre)-feasibility studies: vulnerabilities of different project locations and technical solutions need to be carefully considered
 - CC VRA should be a starting point for each study and an important input into an Option Analysis;
- Project design:
 - General resistance to go beyond existing standards – waiting for the standards to change;
 - Need to look beyond the project limits e.g. impacts on adjacent land;
- Procurement & construction: ensure planned resilience level is achieved
 - Design by Contractor (Yellow FIDIC) or alternative technical solutions - include requirements to prove CC resilience;
- Operational phase:
 - Continuously collect and analyse climate data and use it as an input into operations & management;
 - Importance of adequate maintenance and operational measures incl. adjacent areas;
 - Coordinated risk and disaster responses and importance of early warning systems;
- Dealing with uncertainty: planning of future adaptation measures for certain time horizons/ thresholds; adaptation pathways.

Current and future challenges:

- Further integrate climate change considerations in infrastructure development and management!



Questions – based on your experience:

- When are climate change adaptation considerations normally incorporated into the project cycle (at planning, design, implementation or operation stage)? How?
- What have been related difficulties and challenges encountered? (e.g. availability of data at a required level, expertise, design standards limitations, etc.?)
- What is your experience with implementation of the adaptation measures proposed and their actual effectiveness?
- What do you see as the most urgent and critical issues that would require support and/or cooperation in this area?



Integrating climate change in transport networks management



- **Some outcomes from the first workshop**
- **Best Practice Case Studies**

Network analysis – some main outcomes

- National Adaptation Strategies: broad differences on countries as regards level of detail and applicability at sector level
- Monitoring and data collection are key for understanding climate impact
- It is useful and recommended to identify relevant climate hazards and existing networks vulnerabilities (e.g. hotspots) in a GIS system. Existing examples could be replicable in other countries, technical advisory support would be appreciated
- Importance of climate projections (including trends analysis and uncertainty considerations). Further guidance on scenarios
- Involving the right people: need of cooperation between various organisations, units and sectors
- Network approach provides a more comprehensive approach: integrating climate change into management and development of transport networks

Integrating climate change in transport networks management

- Climate change risk assessment: moving from a network approach to project assessments
Alberto Compte Anguela - Ministerio de Fomento, Spain
- Climate Change adaptation on the national road network
Grzegorz Łutczyk - GDDKiA, Polish National Road Administration, Poland
- The case of adaptation of the French railway company SNCF
Vivian Depoues - I4CE, France
- Analysis of climate change impacts and adaptation for Polish Railway network
Magdalena Kozyra - PKP, Polish National Railways, Poland

Conclusions



- **Conclusions**

Some summary reflections to take home...

- Further integrate climate change considerations in infrastructure development and management;
- Ensure CC VRA is included in ToRs for your feasibility and design studies as well as construction and O&M contracts;
- Get and analyse as detailed local data and always look into the past events – they can help you to understand what is likely to happen in future
- Most CC impacts happen during the operation of the transport infrastructure assets – make sure operators and network managers are involved when these assets are planned and designed (design for maintenance & operation)
- It is not meant to be just a paper-based exercise for the purposes of a financing application – papers fade away but insufficiently resilient assets & networks remain a liability of a member state for decades to come.

Feedback and Next Steps

Publications



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 Assessment
 Polish version ([Networking Platform Website](#))



JASPERS Brochure - Roads and Climate Change
 ([JASPERS Website](#))

Contact us

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JASPERS Networking Platform:
www.jaspersnetwork.org

More Information

For info or further questions on this seminar and the activities of the JASPERS Networking Platform, please contact the JASPERS Networking and Competence Centre at the following email:

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