Adaptation of transport networks to climate change

WORKSHOP ON SUSTAINABLE DEVELOPMENT GOALS AND HOW THEY CAN BE ACHIEVED IN INLAND WATERWAYS

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Focus

Outcomes of the work of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

in relation to

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.2 Integrate climate change measures into national policies, strategies and planning

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
Some examples of climate change impacts on transportation infrastructure and operations

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Road</th>
<th>Rail</th>
<th>Waterways and ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher mean temperatures; heat waves/droughts; changes in the numbers of warm and cool days</td>
<td>Thermal pavement loading and degradation</td>
<td>Track buckling</td>
<td>Damage to infrastructure, equipment and cargo</td>
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<td>Reduced snow cover and arctic land and sea ice; permafrost degradation and thawing</td>
<td>Asphalt rutting</td>
<td>Infrastructure and rolling stock overheating/failure</td>
<td>Higher energy consumption for cooling</td>
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<td></td>
<td>Thermal damage to bridges</td>
<td>Slope failures</td>
<td>Potential reductions in snow/ice removal costs</td>
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<td></td>
<td>Increased landslides</td>
<td>Signaling problems</td>
<td>Occupational health and safety issues during extreme temperatures</td>
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<td></td>
<td>Reduced integrity of winter roads and shortened operating seasons</td>
<td>Speed restrictions</td>
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<tr>
<td>Precipitation</td>
<td>Inundation, damage and wash-outs of roads and bridges</td>
<td>Flooding, damage and wash-outs of bridges</td>
<td>Infrastructure inundation</td>
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<tr>
<td>Changes in the mean values; changes in intensity, type and/or frequency of extremes</td>
<td>Increased landslides</td>
<td>Problems with drainage systems and tunnels</td>
<td>Navigation restrictions in inland waterways due to river water levels changes</td>
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<tr>
<td>Sea levels/storm surges</td>
<td>Impacts on bridges</td>
<td>Delays</td>
<td></td>
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<tr>
<td>Mean sea level rise</td>
<td>Erosion of coastal roads</td>
<td>Bridge scour, catenary damage at coastal assets</td>
<td>Asset inundation</td>
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<tr>
<td>Increased extreme sea levels</td>
<td>Flooding, damage and wash-outs of roads and bridges</td>
<td>Disruption of coastal train operation</td>
<td>Navigation channel sedimentation</td>
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<td></td>
<td>Maintenance costs</td>
</tr>
</tbody>
</table>
Current impacts vs future potential impact
Attempt to understand the future impacts
Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes
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Some of the lessons learned:
- Data limitations
  - on transport infrastructure (geocoded)
    and on usage data (traffic volumes, freight processed)
- First step analysis as a good basis – exposure identified
- First step analysis insufficient / complementary analysis needed (natural and anthropogenic factors, characteristics of specific asset, downscaling of projections, impact modelling....)
Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

Some of the recommendations:
- Improve availability of geocoded networks and nodes data (call to WPs managing the infrastructure agreements)
- Geocode networks and nodes data and present them in GIS
- Share data on use (census by WP.6)

- Implement national projects (with assistance where necessary) to better understand vulnerability to climate change of transport systems
Outcomes of the Group of Experts on Climate Change Impacts and Adaptation for Transport Networks and Nodes

Requested follow-up

- Geocode AGN

- Make available data on the collection of the traffic data
Influence of weather and climate extremes on supraregional traffic flows – Stress test scenario
Middle Rhine
Thank you for your attention