ADAPTATION OF TRANSPORT INFRASTRUCTURES AND NETWORKS TO CLIMATE CHANGE

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# French Climate Change Adaptation Plan - Context

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>2006</td>
<td>National Adaptation Strategy Report – Impacts and costs of climate change</td>
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<tr>
<td>2009</td>
<td>PNACC preparation: National and local consultation</td>
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<td>2010</td>
<td>French National Adaptation Plan - PNACC</td>
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<td>2011</td>
<td>COP 21 PNACC research and studies</td>
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<td>2015</td>
<td>The new PNACC</td>
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<tr>
<td>2016</td>
<td>Reports on Climate Projections in France</td>
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Action 2 – Study the impact of climate change on transport demand and the consequences for reshaping transport provision

Action 3 – Define a harmonized methodology to identify the vulnerability of infrastructures and land, sea and airport systems

Action 4 – Establish a statement of vulnerability for land, sea and air transport networks in continental France and in French overseas territories and prepare appropriate and phased response strategies to local and global climate change issues
The Working Group

Sponsor
French Ministry for Environment, Energy and the See

Project manager
Cerema

The Technical Working Group
Cerema, SNCF, STAC, STRMTG, VNF

Infrastructures taken into account
Airport infrastructures
Cable transport infrastructures
Earthworks
Highway infrastructures
Highway constructions
Maritime, port and river infrastructures
Rail and guided transport infrastructures
Urban roads
1. Learning about climate and climate change trends

2. Analysing major actual and future climate impacts

3. Listing normative, regulatory, technical documents that should be impacted

4. Listing climate projections useful to adapt documents

5. Dealing with standardization

5’. Dealing with technical documents

6. Adapting documents
Impacts are due to climate variables changes or correlated consequences

Impacts are expected on design, maintenance and operation

Adaptation needs precisions on existing climate variables or new indicators

**A1 – Adaptation of Documents**

Climate zone, drainage, freeze, freeze-thaw cycle, groundwater, lightening, rainfall, snow, temperature, wind, etc.

- Roads
- Urban roads
- Bridges, tunnels
- Railways
- Maritime, port and waterways
- Aeronautic
- Ropeway and guided transport

![Graph showing the number of documents analyzed for different categories of transport systems.](image)

- Main climate variable to adapt
- Technical documents to update
- Documents needing further analysis
- Not to be updated
- Normative and regulatory documents to update

**Number of documents analyzed**

0 20 40 60 80 100 120

**Roads**

**Urban roads**

**Bridges, tunnels**

**Railways**

**Maritime, port and waterways**

**Aeronautic**

**Ropeway and guided transport**
Aim of the study: listing and analysing major issues to adapt mobility

Methods: analysis of an international bibliography, including French local adaptation strategies; analysis of such issues in towns with similar climates

Results:
- Examples of climate change impacts on mobility
- Analysis of how some French local adaptation strategies take into account mobility adaptation
- Methodological elements to adapt mobility
- Listing and analysis of adaptation measures
Defining scope, study of area and purpose of the analysis

- Physical vulnerability assessment
- Extreme climate events assessment
- Functional vulnerability assessment
- Physical criticality assessment
- Functional criticality assessment
- Risk assessment

Strategy of adaptation
A3 – Risk Analysis

Physical vulnerability assessment
- Dividing network into sections, infrastructures and components
- Listing vulnerabilities factors
- Scoring physical vulnerabilities

Extreme climate events assessment
- Selecting relevant extreme climate events
- Scoring extreme climate events

Extreme climate events assessment
- Defining vulnerability issues

Functional vulnerability assessment
- Scoring extreme climate events - intensity, temporal and spatial occurrences

Physical criticality assessment
- Combining physical vulnerability scoring and climate events scoring

Functional criticality assessment
- Choosing a methodology of assessment
- Scoring functionnal vulnerabilities

Risk assessment
- Combining physical and functionnal criticalities scoring

Specific datas linked with transport functionnal issues, depending on the assessment methodology

Result: sections and infrastructures scored by risk levels
Toward a new PNACC 2016-2020 with a continuity of actions

Action 1:
- Over 1000 documents analyzed, 241 listed, 30% with a need of further studies or with a need of adaptation
- Today: involvement in standardization, small technical working groups

Action 2: issues on mobility adaptation need to be shared with planners

Action 3:
- An applicable methodology... still under development, tested with pilot studies applied on various study areas and transport types
- Next steps: automation of the methodology, adaptation solution strategies
Thank you for your attention

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Reports are available on: