MOBILITY & CLIMATE CHANGE

WHAT DOES IT MEAN FOR A SUSTAINABLE MOBILITY PROVIDER

ADAPTATION OF TRANSPORT NETWORKS FOR CLIMATE CHANGE
SNCF - SUSTAINABLE DEPARTMENT
27 JUIN 2012
FRANCE & CLIMATE CHANGE

↑ 40%

OF FRENCH PEOPLE THINKS CLIMATE CHANGE IS THE MOST PREOCCUPANT ENVIRONMENTAL RISK

Survey IFOP for WWF – March 2012
FRENCH FRAMEWORK FOR ADAPTATION
TO PREPARE TOMORROW

PNACC (July 2011)
ECOMOBILITY & CLIMATE CHANGE
GUIDELINES FOR TRANSPORTS

Action #1: To review and adapt technical standards for construction, maintenance and operation of transport networks (infrastructures and equipment) in continental France and French overseas territories.

Action #2: To study the impact of climate change on transport demand and the consequences for reshaping transport offer.

Action #3: To define a harmonised methodology to diagnose the vulnerability of infrastructures and land, sea and airport transport systems.

Action #4: To establish a statement of vulnerability for land, sea and air transport networks in continental France and in French overseas territories; To prepare strategies of appropriate and phased response to local and global climate change issues.

The possible technical requirements and norms update will require to mobilize SNCF as WORKS OWNER for the rolling stock, railways INFRASTRUCTURE delegated MANAGER and as OPERATOR for the urban transportation.
SNCF ADAPTATION PLAN
A LONG-TERM PROCESS
SNCF GROUP AT THE END OF 2011: 5 DIVISIONS / €32.6 BILLION IN REVENUE

<table>
<thead>
<tr>
<th>DIVISION</th>
<th>Key Activities</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNCF INFRA</td>
<td>Rail network management, operation, maintenance on behalf of RFF and engineering of primarily rail infrastructures</td>
<td>€5.3 billion</td>
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<tr>
<td>SNCF PROXIMITÉS</td>
<td>Public urban, outer urban and regional transport for daily rail transport</td>
<td>€12.3 billion</td>
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<td>SNCF VOYAGES</td>
<td>Regional Express train (TER), Transilien in Paris area and Intercités in France, Keolis in France, Europe, the United States, Canada and Australia</td>
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<td>SNCF GEODIS</td>
<td>Freight transport and logistics</td>
<td>€9.4 billion</td>
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<td>Station management and development, independent from carrier activity</td>
<td>€1.2 billion</td>
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- **SNCF INFRA**: Rail network management, operation, maintenance on behalf of RFF and engineering of primarily rail infrastructures. Activity in France, + engineering in Europe, Asia, the Middle East, Africa, the Americas. Revenue: €5.3 billion.
- **SNCF PROXIMITÉS**: Public urban, outer urban and regional transport for daily rail transport. Revenue: €12.3 billion.
- **SNCF VOYAGES**: Regional Express train (TER), Transilien in Paris area and Intercités in France, Keolis in France, Europe, the United States, Canada and Australia. Revenue: €7.3 billion.
- **SNCF GEODIS**: Freight transport and logistics. Europe (France, Spain, the United Kingdom, Belgium, the Netherlands, Germany, Austria, Switzerland and Italy). Revenue: €9.4 billion.
- **GARES & CONNEXIONS**: Station management and development, independent from carrier activity. 3,000 French stations, AREP subsidiary operates internationally. Revenue: €1.2 billion.
CLIMATE CHANGE STAKES FOR SNCF?

- **Investments (2 Billion / yr)**
  - Train: 35 - 40 years
  - Station: 60 years
  - High Speed Line (RFF): 100 years

- **Risks**
  - Eco-design for trains and stations
  - Production tools resilience
  - Crisis management

- **Opportunities**
  - New tourism demand: short & middle distance
  - Low GHG emissions & low energy consumption
# CLIMATE CHANGE: AN OPPORTUNITY FOR SNCF

**THE « CLIMAT D RAIL » PROJECT**

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Identification of CC impacts, Vulnerability and adaptation schedule</td>
<td>Adaptation alternatives vs. impacts</td>
<td>Scenarios towards the future (social, economic, environment, mobility,…)</td>
<td>Plans for each division and global governance</td>
</tr>
</tbody>
</table>

**First Studies**

- **Operative**
WEATHER: MODIFICATIONS FOR EUROPE

- **↑** winter rainfall (floods)
- **↑** sea levels
- **↑** hotter and drier summers
- **↑** crop yields, range

- **↑** sea / lake levels
- **↑** storms, floods
- **↑** hotter and drier summers
- **↑** growing seasons
- **↑** crop potential
- **↑** pests
- **↑** permafrost thaw

- **↑** winter rainfall (floods)
- **↓** summer rainfall
- **↑** drought risks
- **↑** soil erosion risk
- **↑** growing season length
- **↑** crop yields and range

- **↑** temperature
- **↓** annual rainfall, water availability
- **↑** drought risk, heat stress
- **↓** crop yields
- **↓** suitable crop areas
2050:
WARMER SUMMERS & HEATWAVES!

A2

B1

2020 2030 2040 2050
RAILWAYS SYSTEM RESILIENCE:
COMPONENTS FOR AN INTEGRATED MOBILITY OPERATOR...
## INVESTMENT vs ORGANISATION

### TIMETABLE FOR DECISIONS « WITHOUT REGRETS »

<table>
<thead>
<tr>
<th>INFRASTRUCTURE</th>
<th>Years</th>
<th>MARKETING SYSTEMS</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation and production of an infrastructure work</td>
<td>150</td>
<td>Management software</td>
<td>15</td>
</tr>
<tr>
<td>Electrification</td>
<td>80</td>
<td>Ticketing</td>
<td>10</td>
</tr>
<tr>
<td>Production and setting-up of tracks</td>
<td>50</td>
<td>Pricing</td>
<td>5</td>
</tr>
<tr>
<td>Revegetation along the tracks and slopes</td>
<td>15</td>
<td>Communication campaign</td>
<td>0,5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRAIN STATION</th>
<th>Years</th>
<th>ROLLING STOCK</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation and operation of the new station</td>
<td>100</td>
<td>Investment for new rolling stock (full set of coaches)</td>
<td>40</td>
</tr>
<tr>
<td>Creation of platforms</td>
<td>50</td>
<td>New traction unit</td>
<td>20</td>
</tr>
<tr>
<td>Design of a train station</td>
<td>30</td>
<td>Comfort elements</td>
<td>20</td>
</tr>
<tr>
<td>Reorganisation of public areas</td>
<td>20</td>
<td>Fitting of toilets</td>
<td>20</td>
</tr>
<tr>
<td>Air conditioning/heating systems</td>
<td>15</td>
<td>Repairing of existing rolling stock</td>
<td>15</td>
</tr>
<tr>
<td>Setting up of common services (toilets, water access)</td>
<td>15</td>
<td>Air conditioning/heating systems</td>
<td>15</td>
</tr>
<tr>
<td>Setting-up of a waiting room</td>
<td>10</td>
<td>Purchasing of driver assistance and consumption optimisation systems</td>
<td>10</td>
</tr>
<tr>
<td>New organisation of reception centre</td>
<td>5</td>
<td>Leasing operation</td>
<td>10</td>
</tr>
<tr>
<td>Setting-up of Passenger information systems</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Heatwaves
- Rails: overheating & torsion
- Catenaries: overheating & distortion
- Tracks & Trains: electric and electronic equipments disruption
- Station & Trains: global comfort (temperature, humidity)
- Track: High temperatures for workers
- Track: Fire

Rain
- Tracks, Stations, Tunnels: Flood (drainage systems)
- Bridge: increase of stream flow, fretting wear
- Landslides
- Tracks: Erosion, excavation
- Tracks: signals equipments disruption
- Impracticable roads: modal transfer to the train

Snow
- Switchpoint: Accumulation of snow and disruption
- Trains: doors and harness equipment disruption
- Tracks & Trains: electric and electronic equipments disruption
- Tracks: signals equipments disruption
- Tracks & Trains: electric and electronic equipments disruption
- Trains: doors and harness equipment disruption
- Trains: broken windows
- Blocked switchpoint
- Difficulties of starting up of the driving machines
- Ice-cold rails > Loss of efficiency of the braking
- Icing of catenaries

Coldest days
- Track: High temperatures for workers
- Embrittlement of rails
- Stations: Black ice, slippery platforms
- Trains: doors and harness equipment disruption
- Trains: broken windows
- Blocked switchpoint
- Difficulties of starting up of the driving machines
- Ice-cold rails > Loss of efficiency of the braking
- Icing of catenaries

Legend:
- Station
- Journey condition
- Rolling stock
- Infrastructure
- Impracticable roads: modal transfer to the train
HEATWAVES: LONGER & HOTTER

©Météo France
### ENGINEERING: AVAILABLE SOLUTIONS

**EXAMPLE: HEATWAVES TECHNICAL ANSWER**

<table>
<thead>
<tr>
<th>RISK</th>
<th>IMPACTS ON SNCF</th>
<th>POSSIBLE ADAPTATION MEASURES</th>
</tr>
</thead>
</table>
| Overheating of the temperature in the passenger car | Discomfort or even uneasiness of personnel and passengers | > Having longer preparation of trains  
> Higher specification of the air conditioning  
> Improvement of ventilation (modelled on the VMC turbofan)  
> For vehicles travelling at moderate speed (eg. Trams), installing ventilation without air conditioning (eg. Tram in La Réunion) |
| Alteration or premature wearing of on-board electronic systems or signalling systems along the tracks | Loss of reliability | > More frequent maintenance  
> Tougher specifications |
| Engine overheat                                  | Loss of power of traction units         | > Slow down of traffic  
> Choice of less flammable plant species  
> Preventive coordination with Civil security |
| Vegetation drought                               | Fires along the tracks                  | > Fences along the tracks  
> « Cow-catcher » at the front of the locomotives |
| Migration of certain insects to the North, due to global warming | Presence of animals along the tracks, searching for pasture | |
|                                                | Infestation of insects in the passenger cars (ventilation systems, sleeper trains,...) | |
STATIONS BUSINESS CASE

NEW FRAME FOR VENTILATION
(Source DB 2004)

PHOTOVOLTAIC PANELS ON THE PARKING OF THE ALBACETE STATION
(Source ADIF 2010)

SOLAR PANELS ON THE ROOF OF STILLWELL AVENUE STATION
(Source NYCT 2004)
INFRASTRUCTURE BUSINESS CASE

SNOWPROTECT™ (Source Sealeze)

Sprinkler

Snow blower (Air jet) (Source JR EAST)
ROLLING STOCK BUSINESS CASE

PROTECTION OF THE HARNESS EQUIPMENT & LOCAL HEATING DEVICE (Source DB)

INFORMATION & COMFORT EQUIPMENTS (Source Alstom)
SNCF: ADAPTATION PLAN

**TO KNOW**
- Risk and Opportunities Cartography

**TO CHOOSE**
- Climate proofing of investments and design, inspection and maintenance standards review
- Updating of prevention plan and crisis management
- Development of alternative mobility solutions

**TO DECIDE**
- Climate governance with stakeholders and awareness of regional authorities representatives
- Development of climate communications towards customers
- To carry out climate crisis exercises
## WHAT CLIMATE SERVICE FOR SNCF ?

<table>
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<tr>
<th>POSSIBLE INITIATIVES</th>
<th>ASSOCIATED CLIMATE SERVICE</th>
</tr>
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<tbody>
<tr>
<td>Territorial analysis of climate vulnerabilities. Climate modelling at the local level</td>
<td>Mapping of the territorialized risks and modellings of the investments</td>
</tr>
<tr>
<td>Adapt the references of construction, operation and maintenance of infrastructure subject to climate change</td>
<td>Expertise for the « robustness» of the Eurocode norms</td>
</tr>
<tr>
<td>Improve the knowledge of resistance of materials to new demands</td>
<td></td>
</tr>
<tr>
<td>Prepare and sensitise the population, users and officials about the effect of climate change</td>
<td>Pedagogy of the stakeholders (customers, shippers, elected officials, local authorities) on climate change</td>
</tr>
<tr>
<td>Eco-design elements of the transport system (rolling stock, stations, information systems, energy supply) to be more robust</td>
<td>New criteria in specifications compared to the recurring risks and the cost of the “without regrets” decisions</td>
</tr>
<tr>
<td>Vulnerability of mountain resorts, adaptation of tourist activities in coastal areas, prospective study on the transformation of tourism on climate change, sectorization of summer holidays, warning devices during extreme weather events</td>
<td>Studies of the evolutions of tourist places natural resources compared to their access and to the medium-term climatic risks (10 - 20 years)</td>
</tr>
<tr>
<td>New crisis management devices and mobility governance in case of exceptional events</td>
<td>Establishment of a risk ladder for public authorities and operators based on Mobility recommendations (or suspension of the mobility)</td>
</tr>
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</table>
HOW TO MANAGE ENERGY COSTS, LOW GHG EMISSIONS AND SUSTAINABLE MOBILITY?

• International Tourism (PNUE):
  CO2 emission 5% (~1.3 Billion CO2Teq)
  • 40% plane flight
  • 32% road transportation
  • 21% for accommodation

• 5% of French tourists are responsible for around 50% CO2 emission
For Transportation (3 millions of French tourists >> 15 millions CO2Teq)

To anticipate for this decrease of tourist demand:

► New tourist destinations
► New tourism flow
► Development of Responsible tourism behavior
► Use of low carbon emission mobility
► Change the ratio distance / stay of journey
THANK YOU FOR YOUR ATTENTION!

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