Extreme Weather Impacts on European Networks of Transport

Project for the call TPT.2008.1. Assessing disruptive effects of extreme weather events on operation and performance of EU transport system

EASA International Air Safety & Climate Change Conference (IASCC) September 8-9, 2010

Dr. Pekka Leviäkangas
VTT Transport & Logistics
Bio of Pekka

Chief Research Scientist    VTT Technical Research Centre of Finland
Vice-President             Jaakko Pöyry subsidiary (JP-Transplan)
Corporate Analyst          Finnish Railways (VR Group)
Road Policy Engineer       Finnish Road Administration S-E district
R&D Manager                Finnmap Ltd.

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Adjunct professor, University of Oulu, dept. of industrial engineering and management, *business and investment analysis in transportation*

Adjunct professor, Technical University of Tampere, dept. of logistics and business information management, *transport and logistics*
Goal and research strategy

The goal of EWENT project is **to assess the impacts of extreme weather events on EU transport system**. These impacts are monetised. EWENT will also evaluate the efficiency, applicability and finance needs for adaptation and mitigation measures which will dampen and reduce the costs of weather impacts. The methodological approach is based on generic risk management framework that follows a standardised process from identification of hazardous phenomena (extreme weather), followed by impact assessment and closed by mitigation and risk control measures. EWENT will start this by identifying the hazardous phenomena, their probability and consequences and proceed to assessing the expected economic losses caused by extreme weather when it impacts the European transport system, taking also into account the present and expected future quality of weather forecasting and warning services within Europe.

EWENT will apply **the IEC 60300-3-9 risk management standard framework** all the way through its research process and the project’s work breakdown also follows the standard structure (see slide no 4).
OBJECTIVE: Risk management strategy for the EU transport system to prepare for and mitigate the impacts and costs of extreme weather phenomena

WP1: Extreme weather phenomena that have potential internal and external cost impacts on EU transport system; the threshold criteria for weather parameters

WP2: The probability of extreme weather and scenarios for increased probabilities and intensity

WP3: Impact mechanisms for system failures or disturbances (mobility meltdown, reduced safety and security) and operational failures (predictable mobility of passengers and goods); impacts on selected transport system performance indicators

WP4: Estimation of expected costs of extreme weather on time axis, based on identified impacts and scenarios: infrastructure (material damages), operations and traffic (accidents, time delays)

WP5: Evaluation of likely scenarios and most relevant costs; listing of prospective mitigation and adaptive strategies; risk panorama for EU transportation system

WP6: Assessing the effectiveness and preliminary investments required by different mitigation strategies on time axis; e.g. new weather information services, new institutional co-operative models (especially between authority functions and across national boundaries), development needs of standards and engineering guidelines for transportation infrastructures
The consortium

List of participants:

<table>
<thead>
<tr>
<th>Participant no.</th>
<th>Participant organisation name</th>
<th>Short name</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Coordinator)</td>
<td>VTT Technical Research Centre of Finland</td>
<td>VTT</td>
<td>FI</td>
</tr>
<tr>
<td>2</td>
<td>German Aerospace Center</td>
<td>DLR</td>
<td>DE</td>
</tr>
<tr>
<td>3</td>
<td>Institute of Transport Economics</td>
<td>TÖI</td>
<td>NO</td>
</tr>
<tr>
<td>4</td>
<td>Foreca Consulting Ltd</td>
<td>Foreca</td>
<td>FI</td>
</tr>
<tr>
<td>5</td>
<td>Finnish Meteorological Institute</td>
<td>FMI</td>
<td>FI</td>
</tr>
<tr>
<td>6</td>
<td>Meteorological Service of Cyprus</td>
<td>CYMET</td>
<td>CY</td>
</tr>
<tr>
<td>7</td>
<td>Österreichische Wasserstraßen GmbH</td>
<td>via donau</td>
<td>AT</td>
</tr>
<tr>
<td>8</td>
<td>European Severe Storms Laboratory</td>
<td>ESSL</td>
<td>DE</td>
</tr>
<tr>
<td>9</td>
<td>World Meteorological Organisation</td>
<td>WMO</td>
<td>UN</td>
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</tbody>
</table>
Modal coverage

<table>
<thead>
<tr>
<th>Depth of analysis</th>
<th>Aviation</th>
<th>Land transport</th>
<th>Marine &amp; waterways</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Passenger</td>
<td>Freight</td>
<td>Road</td>
</tr>
<tr>
<td>Detailed</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Brief</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excluded</td>
<td></td>
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<td></td>
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</tbody>
</table>

The transport system is viewed from three angles:
- **infrastructure**; these are direct material damages or deterioration of physical infrastructures
- **operations**; these are harmful impacts on traffic safety and transport reliability (both freight and passenger)
- **indirect impacts to third parties**, e.g. supply chain customers and industrial actors.
Cost impact vs. cost absorption

System impact disruptive level

*rain fall
*snow fall
*wind speed
*etc.

Intensity

Impact

Disruptive level

Costs associated!

Cost absorption
Impact analysis – example railways

Phenomena | Impact | Consequences
---|---|---
Thunderstorms | Lightning strikes, Electricity shocks, Power failures | Traffic control systems | Time delays, Accidents
Storm winds | Falling trees, Line cuts | Power supply systems | Customer dissatisfaction, Disturbances
Snow storms | Stacking snow, Frozen switches | Switches | Increased maintenance / repair costs
## Indicators & cost assessment & economic analysis

<table>
<thead>
<tr>
<th>Performance indicator</th>
<th>Cost item</th>
<th>Method for unit values</th>
<th>Source or reference</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Accidents</td>
<td>WTP</td>
<td>eIMPACT study or alternative EU covering studies</td>
<td>Covers material and human losses (injuries, fatalities)</td>
</tr>
<tr>
<td>Time, reliability, profitability, revenues</td>
<td>Time</td>
<td>WTP</td>
<td>eIMPACT study or alternative EU covering studies</td>
<td>Covers both passenger time and freight time; freight time must be upscaled from road transportation to other modes</td>
</tr>
<tr>
<td>Reliability, profitability, revenues</td>
<td>Hindered journeys and transports</td>
<td>Opportunity cost of a transport; WTP</td>
<td>Indirect assessment from other studies</td>
<td>The most uncertain cost item to assess</td>
</tr>
</tbody>
</table>
Schedule & other info

• The project started in December 2009.
• Duration: 30 months.
• Total budget: ca 2 MEUR
Overall management architecture

- **Consultative Board**
  - EC-DG RTD

- **Broad Management Team**
  - Project co-ordinator
  - Assistant project manager

- **Core Management Team**
  - Project Bureau
    - quality control
    - day-to-day operation
    - internal communication
    - Planning, reporting, financial control

- **Steering Committee**
  - Partner 2
  - Partner 3
  - Partner 4
  - Partner 5
  - Partner 6
  - Partner 7
  - Partner 8
  - Partner 9
Key persons

Policy Officer: Dr Karsten Krause European Commission
Coordinator: Dr Pekka Leviäkangas VTT
Core Management Team: Dr Leviäkangas, Ms Molarius, Dr Veikko Rouhiainen, Dr Lasse Makkonen, Ms Ulla Peltonen, Ms Anu Tuominen, Mr Pekka Kulmala – all from VTT
Broad Management Team: Dr Leviäkangas, Ms Molarius VTT
Dr Frank Rehm DLR
Dr Johanna Ludvigsen TÖI
Dr Pirkko Saarikivi Foreca Consulting
Dr Pertti Nurmi FMI
Dr Silas Michaelidis CYMET
Dr Juha Schweighofer via donau
Dr Pieter Groenemeijer ESSL
Mr Dimitar Ivanov WMO
Key body members

Consultative Board:
Ms. Nancy Saichs, EIB
Mr. Martti Mäkelä, Ministry of Transport Finland
Dr. Cristina Pronello, Politecnico di Turin
Dr. Olaf Novak, Allianz
Mr. Philippe Crist, OECD
(Dr. Karsten Krause European Commission)

“Steersmen”:
Dr. Matti Kokkala VTT
Dr.-Ing. Thorsten Mühlhausen DLR
Dr. Adriaan Perrels FMI
QQ, ”steersman” to be nominated
Status in September 2010

- First deliverables issued
- Number of interested parties volunteered to join the network, e.g.:
  - OECD
  - CER
  - SNCF
  - EASA
  - Companies
  - Other research projects
- Project web-site: http://ewent.vtt.fi/ running
D1
Review on extreme weather impacts on transport systems

Extreme weather impacts on European networks of transport

Grant Nr 233919
Co-funded by the European Commission under the 7th Framework Programme, Transport, Horizontal activities
Heavy rain in the Central Europe

Phenomena

Impacts

- The railway stations and/or rail links under water, rail services stop
- The metro stations and/or rail links under water, metro services stop
- Roads and traffic areas under water, traffic stops
- Trees fall on the rails, rail traffic stops
- Trees fall on the roads, traffic stops

Consequences

- Strain on the bus and tram infrastructure
- Destruction of road infrastructure
- Bridge inspections
- Traffic accidents, indirect impacts (e.g. cargo damages)
- Injured or dead persons
- Car evacuation
- Broken sea wall protecting infrastructures
- Delays, undesirable effects on traffic interoperability
- Traffic accidents
- Injured or dead persons
Status of the European Severe Weather Database

Application, e.g., tornado incidence

ESWD
www.eswd.eu

Tornado
1990 - 2009

Reports per year per 10 000 km²

Output formats at essl.org/ESWD/:

- Public: Map, HTML text table
- Users: also ASCII + CSV raw data

26/04/2010 \( n = 24688 \) reports since 1950

NMHS Partner
### Media data file including > 200 cases

<table>
<thead>
<tr>
<th>Date</th>
<th>Type</th>
<th>Description</th>
<th>Location</th>
<th>Sector</th>
<th>Impact</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.11.2007</td>
<td>Heavy snow</td>
<td>Strong wind, More than ten centimetres of snow</td>
<td>Sweden</td>
<td>Roads</td>
<td>Large numbers of motorists trapped in their cars on snow-blocked road, snowploughs and gritting trucks have been unable to get through, military all-terrain vehicles were able to help get control of the situation</td>
<td><a href="http://www.thelocal.se/9091/20071113/">http://www.thelocal.se/9091/20071113/</a></td>
</tr>
<tr>
<td>24.12.2007</td>
<td>Hail</td>
<td>First flush - &quot;mud flush&quot; (mudslide), 40cm of water on the streets</td>
<td>Spain</td>
<td>Roads</td>
<td>Roads A-7 needed to be cut between Velez-Malaga and Torrox in 7 kilometres. Lot of flooding and stream came with the power in Torre del Mar, Caleta, Algarrobo Costa and Mezquitilla.</td>
<td><a href="http://www.alertatierra.com/Torrem1207.htm">http://www.alertatierra.com/Torrem1207.htm</a></td>
</tr>
<tr>
<td>26.12.2007</td>
<td>Heavy rain</td>
<td>45 litres of water per square metre</td>
<td>Spain</td>
<td>Roads</td>
<td>Heavy rain brings flooding to the Western Costa del Sol. The main A-7 road was closed to traffic. Christmas Eve saw a spectacular hail storm in parts of the Axarquia, causing traffic problems and damage to crops in the area.</td>
<td><a href="http://www.typicallyspanish.com/news/publish/article_14305.shtml#ixzz0htj7rH7r">http://www.typicallyspanish.com/news/publish/article_14305.shtml#ixzz0htj7rH7r</a></td>
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Ways to get involved…?

1. Take part in meetings and workshops, dedicated slots

2. Get listed on E-mail & other distribution lists

3. Get involved e.g. in a nominated “Interest Group”
   • This depends on Commission’s views and resources…

4. Be an active contributor (data, views, references, etc.) and hence participate the real work
Other projects with similar focus

• WEATHER – Claus Doll

• ECCONET - Christophe Heyndrickx

• FUTURENET – Chris Baker

• RegioExAKT – DLR
Exploitation of EWENT’s results - examples

• Road concession companies:
  • Maintenance preparedness, ensuring flow through

• Road, rail and airport runway maintenance contractors:
  • Fleet and personnel capacity for peaks, high capacity equipment

• Transport operators and logistic service providers:
  • Contingency planning, risk management

• Bulk logistics (IWW):
  • Planning of load capacities, fleet technology development
Exploitation of EWENT’s results – examples (2)

• Industry:
  • Plant locations, supply chain risk management

• Infrastructure managers:
  • Maintenance strategies, engineering standard setting, long-range planning

• Safety authorities:
  • Preparedness strategies and planning for exceptional situations

• Insurance business:
  • Risk premiums for weather-related incidents

• Project financiers:
  • Project risk management