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Probabilities of adverse weather affecting transport in Europe: climatology and scenarios up to the 2050s

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This paper provides the first comprehensive climatology of the adverse and extreme weather events affecting the European transport system by estimating the frequency (or probability) of phenomena for the present climate (1971-2000) and an overview of the projected changes in some of these extremes in the future climate until the 2050s. The research was carried out within the framework of the EWENT Project that addresses the European Union (EU) policies and strategies related to climate change, with a particular focus on extreme weather impacts on the EU transportation system. This project is funded by the Seventh Framework Programme (Transports, call ID FPT7-TPT-2008-RTD-1).

The analyzed phenomena are wind, snow, blizzards, heavy precipitation, cold spells and heat waves. In addition, reduced visibility conditions determined by fog and dust events, small-scale phenomena affecting the transport system, such as thunderstorms, lightning, large hail and tornadoes and events damaging infrastructure of the transport system, have been considered.

Frequency and probability analysis of past and present ex¬tremes were performed using observational and atmospheric reanalysis data. Future changes in the probability of severe events were assessed based on six regional climate model simulations produced in the FP6 ENSEMBLES project (http://www.ensembles-eu.org/). To facilitate the assessment of impacts and consequences of extreme phenomena on a continental level, the WP2 Deliverable introduces a regionalization of the European extreme phenomena, defining the climate zones with similarities in extreme phenomena.

The projected changes as well as large natural variability in weather extremes on the transportation network will have impacts of both signs. The decline of extreme cold and snowfall over most of the continent implies a positive impact on road, rail, inland water and air transportation, e.g., by reducing snow removal. However, even with a general decreasing trend in winter extremes, due to inter-annual variability winter extremes are still expected to have an impact on transportation, and would still need to be considered in maintenance and investment in preparedness for many European countries. During summer, especially in those countries which already experience high tempera¬tures, further warming implies needs for improvements in the heat tolerance of the transport system. Similarly, increases in heavy precipitation (including heavy snowfall in the North) events and/or wind extremes need to be taken into account in the planning of future transport systems.