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An analysis of impacts of weather storms to railway transportation

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Railway transportation represents technological system which is to a high degree dependent to electricity. Electrification and related automatization of railways have significantly increased the traffic reliability and effectiveness. These complex systems are, however, to a high degree fragile. Storms, particularly when accompanied by strong winds and lightings, are able to cause vast-area outages. The entire railway transportation system is thus very effective but also, at the same time, prone to wide-area collapses (blackouts).

We analyzed a database of railway traffic failures which were caused by storms on the Czech railway network between 2010 and 2017. The length of the Czech railway network is 9 564 km and of that number is 3 236 km (34 %) electrified, including all major tracks. Railway track density with 121 m of track length per km2 ranks among the highest in the world.

More than 6 000 railway traffic interruptions caused by storms have been recorded. This database, administered by the national railway administrator, does not contain direct losses related to the interruptions. Information about the duration of each event is included, however. Almost 60 % of interruptions were mitigated within three hours. The database also contains small amount of events (3 %) that lasted more than one day. Total interruption time then exceeded 48 000 hours. The majority (87 %) of the events concentrated between May and August. The most common problems were then associated with power outages and railway device failures (especially safety systems). Fallen trees which blocked tracks or affected the wires represented only small part (7 %) of all events caused by storms.

We identified, on the basis of the data mentioned above, the most hazardous railway tracks and hotspots of railway traffic blockages (using the KDE+ method). The results will be presented in a map and within a web-map application www.rupok.cz.

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Resources:

Bíl, M., Andrášik. R., Nezval, V., Bílová, M., 2017. Identifying Locations along Railway Networks with the Highest Tree Fall Hazard. Applied Geography 87, 45-53.

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