

## Seasonal variations of atmospheric hazard impacts on infrastructure

\*ELENA PETROVA<sup>1</sup>

1. Lomonosov Moscow State University, Faculty of Geography

Infrastructure facilities consist of power, heat and water supply systems, communication lines, transport infrastructure including roads and bridges, railways, airports, oil and gas pipelines, etc. Above-ground and ground infrastructure facilities are most affected by impacts of various natural hazards, especially those of atmospheric origin. More than 90% of all natural-technological accidents in infrastructure facilities of Russia are triggered by atmospheric hazards such as strong winds, heavy snowfalls and rainfalls, snowdrifts, torrents, thunderstorms and lightning, hailstorms, hard frost, icing, etc. Natural factors cause about 70 percent of “blackouts”, more than 10 percent of accidents at heat and water supply systems as well as water accidents; about four percent of air crashes, automobile and railway accidents, and about two percent of pipeline ruptures. Various atmospheric hazards can also cause long delays in automobile, railway and air transportation of passengers and goods. The majorities of these events are triggered by windstorms and hurricanes (37 percent), snowfalls and snowstorms (27 percent), rainfalls (16 percent), hard frost and icing (12 percent), thunderstorms and lightning (nearly 4 percent). All of these weather conditions are subject to seasonal variations. During the cold season, there are much more weather events influencing the growth in the number of accidents than in the warm season. The author created a database of natural-technological accidents occurring in Russia, including those in infrastructure facilities. More than 18.5 thousands events are registered in the database between 1991 and 2018. The collected information allows analyzing the main causes and triggers of accidents, their distribution within area of Russia, temporal variations, and revealing “weak spots” to cope with. The risk of natural-technological accidents in infrastructure facilities was assessed for Russian federal regions. The Far Eastern, South and North-Western parts of Russia are at the most risk of atmospheric hazard impacts. The risk of natural-technological accidents is highest in Sakhalin region, Krasnodarsky and Primorsky territories.

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