



Natural hazard impact on the technosphere: “blackouts”

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In recent years, natural-technological accidents (NTA) and disasters are increasing in their number and severity all over the world. The term “natural-technological accident (disaster)” applies for an accident (disaster) in the technosphere triggered by any natural process or phenomenon. Their growth is caused, on the one hand, by observed increasing in the frequency and intensity of some natural hazards and hazardous events due to climate change and, on the other hand, by a growing complication of the modern technosphere exposed to natural impacts and advancement of economic activities into the area at natural risk. The most large-scaled natural-technological disaster happened on March 11, 2011 in Japan, as a result of a massive earthquake and tsunami that caused a number of serious technological accidents, including accidents at "Fukushima-1" nuclear power plant, etc. Severe social, ecological and economic consequences of large-scaled NTA make investigation of these events especially important. The most frequent among NTA occurring in Russia are breakdowns in electric power supply systems that lead to so-called “blackouts” (accidental power outages). They are mainly caused by strong winds, snowstorms, deposition of ice, sleet, and snow, rainfalls, floods, and hailstones. Among other triggers earthquakes, hard frost, fierce heat, thunderstorms, landslides, snow avalanches, and debris flows should be mentioned. The great part of transmission facilities in Russia falls on overhead lines that are especially vulnerable to natural impacts. In general, natural triggers are responsible for more than 70 percent of all accidents in power supply systems. They occur more often in Far East, in the Southern and North-Western federal districts, and in some regions of the Central Russia, which are prone to hurricanes, cyclones, snowstorms, and heavy rainfalls accompanying by hailstones, icing, and sleet. A distinctive feature of these events is their synergistic nature, as power outages can cause a chain of other accidents at heat- and water supply, industrial plants, transport and communication facilities, producing so-called “domino effect”. A modernization of facilities, replacement of overhead lines by underground cables and protection from falling trees can reduce the problem.