



## Natural factors of technological disasters in Russia

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More than 90 percent of disasters occurring in the Russian Federation are technological accidents and catastrophes, which account for nearly 80 percent of all the fatalities and affected people. A total of 1966 technological disasters and 152 natural ones occurred in Russia in 2008. In addition to technical, social, and economic causes of technological disasters, natural factors also play an essential role in triggering or magnifying them. A data base of technological disasters happened in Russia since 1992 has been created. More than 11,000 events are listed in the data base. New information is constantly being added to it. Occurrence time and location, a type of disaster, a number of people killed and affected, economic and ecological losses as well as a probable cause of every disaster are registered; its short description is also included. Using collected data a contribution of various natural hazards and phenomena to occurrence of technological disasters in Russia was assessed. Almost 5 percent of all technological disasters listed in the data base were triggered by natural processes. Natural factors caused the most part of accidents at power supply systems (72 percent), 11 percent of accidents at heat- and 9 percent at water supply systems; more than 10 percent of sudden collapses of buildings and mines as well as water accidents; 4.5 percent of pipeline ruptures, and 2 to 3 percent of air crashes, automobile and railway accidents. The majority of these technological disasters and accidents caused by natural factors were produced by windstorms and hurricanes (37 percent), snowfalls and snowstorms (27 percent), rainfalls (16 percent), hard frost and icy conditions of roads (12 percent), and thunderstorms (nearly 4 percent). Climate changes expected until the end of the century will have important consequences for frequency increasing and change in spatial distribution of technological disasters triggered by hydrometeorological phenomena. Increasing of precipitation (especially in liquid form) in cold seasons and alternation of thaw periods and cold spells may trigger abruption of transmission facilities and other lines of communication, sudden collapses of structures and roofs, increasing in number of transport accidents. Fires and explosions caused by heat may be more frequent in south regions. The area of agricultural accidents may be extending. Permafrost area comes to 63 percent in total area of Russia. Expected permafrost thawing may produce risk of roads, railways, and pipelines disruption, destruction of dangerous waste storages, and sudden collapse of buildings and other structures. The problem of relationships between natural hazards and technological disasters needs further investigation, especially from the point of view of climate change expected.