



Socio-economic and health impact of tephra fall and the release of volcanic gases in Iceland

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Three examples of considerable socio-economic and health impact following volcanic eruptions are presented, in which tephra and gas were prominent eruption products. A method how environmental health authorities could assess long-term health effects from tephra fall and gas release is also presented.

The eruptions discussed are the AD 1362 eruption in Iceland's largest volcano Örfajökull, the AD 1783-84 Lakagígar fissure eruption and the AD 1875 eruption of Dyngjufjöll volcano, better known outside Iceland as Askja volcano.

Situated outside the active volcanic zones of Iceland, Örfajökull is a stratovolcano with a large, glacier-filled caldera. It is mainly composed of basaltic rocks, but silicic rocks are conspicuous. Violent silicic eruptions have occurred in this volcano, the last one in the year AD 1362. An estimated 10 km³ of pumice fell in the surrounding countryside and on the ocean, destroying a prospering community with many farms.

On June 8 of the year AD 1783 a large fissure eruption began in southern Iceland. Besides large volumes of basaltic lava (~ 12km³) great amounts of gases were released (500 mill. m³), among them sulfur dioxide and hydrogen fluoride. They had the greatest impact on the lives of the Icelandic people, since they were spread nearly all over country, inhibiting plant growth, which lead to a tremendous loss of livestock and subsequent starvation of many people. This eruption had most likely also considerable health effects on people elsewhere in Europe and lead probably to cooling climate in the years following the eruption.

On March 29 AD 1875 a plinian eruption began in the volcano Dyngjufjöll to the north of Iceland's largest glacier Vatnajökull. About 2 km³ of pumice and ash fell on the countryside to the east of the volcano. It had impact on many rural settlements in Eastern Iceland, who were faced with the fact that life conditions barely tolerable would finally become intolerable with pumice layers on their farmland. Many of them used the opportunity to emigrate to North America.

The impact of large amounts of tephra or gas are unknown to modern society in Iceland. Little is known about environmental and health effects beyond the days or weeks after a devastating eruption. The environmental authority in Reykjavik intends to be prepared to cope with the aftermath of such events, since it is among other duties, responsible for monitoring drinking water quality and air quality, which may be negatively affected by tephra fall and gas release. Using the methods of environmental impact assessment and risk evaluation which are otherwise required for many human developments, as a first step an evaluation of magnitude of possible events is envisaged and how and what kind of information should be spread to other authorities when it comes to apply mitigation activities.