



Terrestrial vulnerability to volcanic hazards in Reykjanes, southwest Iceland.

G. Gisladottir (1,2), E. Erlendsson (1), R. Lal (3)

(1) Earth Science Institute, University of Iceland, Iceland, (2) Department of Geography and Tourism, University of Iceland, Iceland, (3) School of Environment and Natural Resources, the Ohio State University, USA

(ggisla@hi.is /Fax: +354 5254499/ Phone: +354 5254471)

Iceland is a volcanically active island with about 200 known eruptions since settled in late 9th century AD. Reykjanes peninsula, southwest Iceland, is the point where the Mid-Atlantic Ridge rises from the sea. It is characterized by post-glacial lavas, including historical-age lavas and tephra layers which have inflicted serious damage upon settlements and terrestrial resources. In this paper we seek to explain the effects of volcanism on the terrestrial resources in Krýsuvík, Reykjanes peninsula. Soil profiles, dated by tephra layers, have been analysed for the estimation of vulnerability of the vegetation and soils to volcanic hazard. Frequent eruptions in Reykjanes peninsula and off the coast in the 10th century AD; AD 1151-1188; and AD 1210-1240 impacted on the initial Krýsuvík area, which was settled in the 9th century AD. The most critical impacts on the settlement and the surrounding environment were in AD 1151 when the Ögmundarhraun lava overran the settlement, and 75 years later, when an eruption off the shore of Reykjanes in AD 1226 caused widespread tephra deposition such that the winter of AD 1226- 1227, was referred to as “the sand-winter” because of the erosive tephra. The lightweight and easily wind-transported tephra shards abraded and damaged the vegetation and exacerbated soil erosion. The consequent increase in wind-driven soil erosion resulted in increased sediment/soil accumulation at depositional sites. The soil accumulation rate increased from 0.36mm/yr in AD 874-1151 to 0.67 mm/yr in AD 1151-1226 after which the soil thickening increased dramatically, being 1.68mm/yr during AD 1225-1500. The degradation of the soil is represented

by coarser texture, decreased organic C content and soil quality, and loose consistency which undermined the resilience of the soil and made it more susceptible to soil erosion. Erosion and accelerated sediment and soil accumulation started on a large scale following the AD 1226 eruption, further decreasing soil structural stability and its resistance to soil erosion. The initial terrestrial disturbance was directed by volcanic hazards during the Medieval Warm Period to such a grade that the subsequent climatic deterioration during the Little Ice Age and land use lead to land degradation of catastrophic scale. The soil erosion has severely affected the terrestrial carbon and contributed to the atmospheric CO₂. At present 61% of the area is barren and 25% highly degraded and susceptible to soil erosion.