



## **Economic impact of explosive eruptions at Fogo volcano (São Miguel, Açores): The case of tourism sector in Vila Franca do Campo**

Joana Medeiros (1,2), Rita Carmo (1,2), José Cabral Vieira (3), Adriano Pimentel (1,2), Gabriela Queiroz (1,2)

(1) Instituto de Investigação em Vulcanologia e Avaliação de Riscos (IVAR), Ponta Delgada, Portugal (joana.fc.medeiros@azores.gov.pt), (2) Centro de Informação e Vigilância Sismovulcânica dos Açores (CIVISA), Ponta Delgada, Portugal, (3) Faculdade de Economia e Gestão da Universidade dos Açores, Ponta Delgada, Portugal

Active volcanic regions, such as the Azores islands, offer exceptional conditions that favor the development of nature-based activities, such as tourism, one of the main priorities of economic growth of this region. A future volcanic event here may have important consequences in this sector. Therefore, it is fundamental to assess its vulnerability to volcanic hazards in order to try to mitigate the associated risk.

The volcanic history of São Miguel island counts at least 33 subplinian and plinian eruptions in the last 5000 years, revealing it as the most active island of the Azores. Fogo volcano, located in the central part of São Miguel island, although the volcano with the lowest eruptive frequency of the three active central volcanoes of the island, hosted the largest (plinian) eruption of the last 5000 years, Fogo A eruption.

Setting scenarios (the most probable, a VEI 4 subplinian eruption, and the worst-case, a VEI 5 plinian eruption) and creating volcanic simulations for tephra fallout and PDCs, the most common volcanic products related to explosive eruptions, helped us to define the most susceptible areas to be affected by these hazards and, consequently, to identify the vulnerable elements. These simulations show different results from each other, affecting the various municipalities located around the volcano. The proximity of Vila Franca do Campo municipality to Fogo volcano supported its selection as the study area for inventory and characterization of all exposed elements related to tourism sector.

The objective of this work is to evaluate the impact of explosive eruptions on Vila Franca do Campo tourism economy, through a relatively simple method called Updated Loss Value. This methodology allows to quantify the current loss of revenue from tourism industry over 30 years.

The assessment was restricted to the accommodations units, considering three economic scenarios: (1) total destruction of the buildings, (2) destruction of the buildings affected by thicknesses of or greater than 20 cm of tephra resulting from the material of a VEI 4 eruption in summer months, and (3) destruction of the buildings contained within the maximum extension of PDCs resulting from a VEI 4 eruption. Through the individual annual revenue of each establishment, a total annual revenue of about 9.5 million euros was estimated, considering that the accommodation capacity is fully occupied. For all these scenarios, the current loss of revenue from this industry in the municipality over 30 years was determined, taking into account different discount rates and occupancy rates. The analysis of this evaluation allows to conclude that the total destruction scenario is the one that presents the higher loss, admitting an occupancy rate of 0.65 and a discount rate of 0.02, with an updated loss of approximately 145 million euros.

This work reflects a simple approach that can lead to risk analysis, although a more complete analysis will require some additional data, such as all the other exposed elements related to tourism, the hypothetical value of the building and/or infrastructure, and any other parameters that could be included.