Fire in the Earth System Abstracts
Vol. 2 FES-246
Granada, Spain, 4-8 July, 2023

Evacuation priority in the municipality of Alvaiázere: Comparing evacuation models in emergency situations

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Abstract

The year 2017 in Portugal was marked by a devastating wildfire season that resulted in extensive burned area and significant loss of infrastructure and human lives. Since then, several initiatives have been implemented to improve the safety of people and assets in Portugal, such as the "Safe Villages, Safe People" programs, managed by the Civil Protection Agency (ANEPC) since 2018.
This study aimed to analyze the villages (built-up areas) with the highest evacuation priority, in the municipality of Alvaiázere, considering the population density and the time required to evacuate by car to the nearest safe location with shelter. These two variables represent, respectively, exposed population and their response capacity at the village level.
To obtain the map of villages, the boundaries of all the villages were mapped using the built-up areas dataset. Population density at village level was obtained by estimating the number of residents for 2021 according to the variation in the resident population between 2011 and 2021 in the overlapping civil parishes. To calculate the evacuation time, two types of safe locations (destination points) were considered: i) the villages where the Safe Villages (SVs) is already implemented, as a wildfire shelter is selected, and have less than 60% of forest and shrubland in their Village Protection Zone (500m surrounding the village), and ii) the parish councils. The geographic coordinates of the implemented SVs and the location of the parish councils were extracted. A cost-distance was then calculated using GIS tools, with paved roads as ideal path and slope integrated as “cost". Then, the distance in meters of the preferred path from each village to the nearest SV or parish council was calculated, being subsequently converted into time. Both variables were classified based on quintiles, and a matrix was created to combine the two variables.
In Alvaiázere, 35 SVs were implemented so far and only 17 SVs considered as destination, and there are 5 parish councils. Regarding evacuation priority, 9% of villages have a very low priority and 10% of villages have a very high priority (highest quintile). These villages are the ones that require the longest time to reach the nearest shelter and have a higher number of residents. The analysis of these two components can contribute

to prioritizing villages in emergency situations and help planning the implementation of protection measures within the municipality.

Keywords: Wildfire; Population; Coping Capacity; Safe Villages