Fire in the Earth System Abstracts
Vol. 2 FES-249
Granada, Spain, 4-8 July, 2023

Identifying priority villages for wildfire mitigation based on exposure and vulnerability levels at the local scale

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Abstract

In the last decade, extreme wildfire events have occurred in Southern Europe, United States of America, Chile and Australia. In Portugal, the devastating fire season of 2017 has brought to light the fragilities of the wildfire management system and the need to improve the self-protection capabilities of both individuals and communities. This study aimed to assess wildfire risk specifically for human settlements, testing the procedure in three regions of mainland Portugal, representing the west coast (Oeste), the south coast (Algarve) and a central inland sector (Viseu-Dão-Lafões). The wildfire risk analysis procedure, which includes the calculation of three components (hazard, exposure and vulnerability), was adjusted to the spatial extent considered and the data available, to obtain wildfire-related metrics representative for villages. Hazard levels were computed for the surrounding area of villages, using 2 size buffers surrounding the perimeter of villages: i) 100 m; ii) 500 m. The area classified as high and very high hazard (critical area) was retrieved for the two buffers, based on a structural map that combines landcover and topographic conditions. Human exposure was based on the number of residents in each village, using the latest Census data (2021). For vulnerability, the Total Dependency Index (TDI) was calculated, as a proxy of the self-protection abilities of the resident population. This index represents the ratio between young + elderly people (more dependent) and adult population (with more autonomy).
First results indicate that 11% of villages within the three study areas have more than 50% critical area in their surrounding 100 m buffer, increasing to 18% for the 500 m buffer. In these most critical villages, there are 34 700 residents, with 80% living in only 6 villages, 5 located in the central inland area. The procedure applied can contribute to prioritize villages throughout the country, regarding the need to implement wildfire prevention and mitigation strategies. These might include as well landscape conversion measures, whose effects in burn probability can be simulated based on vegetation changes in the surrounding buffers of villages.

Keywords: Wildfire mitigation, villages, human exposure, dependency index

Acknowledgments: This work was funded by national funds through FCT—Portuguese Foundation for Science and Technology, I.P., under the framework of the project “Change4Fire –Modelling landcover and climatic changes for wildfire hazard assessment in future scenarios” [2022.05015.PTDC]