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## Leveraging citizen science for enhanced forest fire management in tropical and subtropical forestry

THE TRUNG HOANG<sup>1</sup>, MORTIMER MÜLLER<sup>1</sup>, QUANG BAO TRAN<sup>2</sup>, FLORIAN HEIGL<sup>3</sup>, HARALD VACIK<sup>1</sup>

<sup>1</sup>*BOKU University, Institute of Silviculture, Austria*

<sup>2</sup>*Ministry of Agriculture and Rural Development, Dept. of Forestry, Vietnam*

<sup>3</sup>*BOKU University, Institute of Zoology, Austria*

### Abstract

In recent decades, forest fires in tropical and subtropical regions have become increasingly frequent and severe, resulting in major ecological losses, affecting rural livelihoods, and claiming the lives of forest rangers who fight these fires. Climate change and land-use changes, such as logging and agricultural expansion, drive this escalation. One approach to study forest fires involves a citizen scientists to collect and monitor forest fuel loads and fire events in real-time with the spot-FIRE app in Hue province, a fire-prone region in Vietnam. This allows to evaluate the potential of forest fire risk-related observations through citizen scientists for improving fire risk assessments and management strategies. The first version of the spotFIRE app, released in 2023, enables and engages citizens in forest fire management by allowing them to document fire events and forest fuel loads. In order to assess the potential value of the forest fuel loads and fire data observations, we performed pilot tests at the same spots by thirty-two participants from different groups, including volunteers, rangers, and forest owners using the spotFIRE app. According to preliminary results, citizens are capable of estimating forest fuel and fire data with relatively high accuracy. The parameters examined include fuel conditions, surface vegetation types, continuity of the flammable surface vegetation, continuity of large woody debris, fuel ladders, and ignition likelihood. The accuracy and quality of the data collected support forest fire prevention activities, thereby contributing to the modelling of fire hazards and the assessment of ecosystem services. In case multiple users report a significant accumulation of dry leaves and fallen branches in a particular forest area, those data can help identify it as a high-risk zone. This allows for timely actions such as targeted controlled burns, silvicultural measures or increasing patrols to prevent fires. Furthermore, the expected results include the establishment of a robust and verified community-driven model for reducing forest fire risks, the implementation of improved approaches for ecosystem management. Last but not least the project should foster greater public engagement in forest fire prevention.

**Keywords:** Citizen science, forest fires, spotFIRE, wildfires