**Exploring the Feasibility of Using Fire Dynamics Simulator to Improve the Calculation of the Wildfire Available Safe Egress Time**

Alfred El Haddad

Supervisor: Prof. Eulalia Planas

Secondary supervisor: Prof. Enrico Ronchi

**Abstract**

Wildland-Urban Interface (WUI) fires pose a significant threat to public safety and property in areas where urban development encroaches upon natural landscapes. This thesis aims to investigate the effect of smoke from a WUI fire on the tenability conditions of a small village and to establish a worst-case-scenario trigger boundary around it as an improved basis for the WUI available safe egress time (WASET). To determine the maximum rate of fire spread and heat release rate, large-scale simulations were conducted using the level set model in Fire Dynamics Simulator (FDS). The results were coupled with corresponding higher resolution small-scale simulations ran with the physics-based model in FDS, where a static fire was simulated at varying distances from the village and the conditions within the village were checked to determine a proper limit-perimeter. The findings of this study show that the minimum limiting distance at which the trigger boundary should be is 200 meters from the village as the temperature can reach over 60 degrees Celsius at a smaller distance. The results provide a more robust approach to determine the fire front arrival distance in WUI areas and inform fire management and public safety strategies. However, the results have certain limitations, including the fact that the simulations were conducted on a single village, and further research is needed to determine the optimal limit-perimeter for other WUI areas. Overall, this study provides a valuable contribution to the field of WUI fire management, and its methodology can serve as an example for future research in this area.

Keywords: Wildfire; Trigger buffer; WUI; WASET; FDS; QGIS; Level set; WUI evacuation

Alfred El Haddad

May 10, 2023