




Abstract

Wildfire Hazard and Risk Assessment in Pulp Paper Industrial Properties under Extreme Weather Conditions: A Case Study in North-Western Portugal [†]

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Since the 1960s, Portugal has been affected by land use/land cover changes, resulting, nationwide, in an increase in fuel contiguity, availability and fire proneness. Within this framework, the assets of pulp paper industries are exposed to large wildfires, which may cause severe economic losses. Science-based information can provide relevant information to effectively allocate resources and protect values at risk.

We assessed wildfire hazard in a 115,000 ha landscape in North-Western Portugal, including 4000 ha of industrial properties where a wildfire risk analysis was performed. We used the Minimum Travel Time algorithm to estimate Burn Probability (BP), Fire Size (FS) and Conditional Flame Length (CFL). The model was calibrated using historical fires above 100 ha that occurred between 2001 and 2019. We located the ignition, determined the active fire spread duration and compiled daily weather data (temperature, air moisture, wind speed and direction). We simulated fire spread over 24 h, using the 97th percentile historical weather conditions and historic ignition probability surface. We mapped landscape hazard and assessed wildfire risk in terms of expected economic losses in eucalyptus productive stands, by combining the annual BP (aBP) with potential losses, estimated based on forest management costs, loss of revenue and burned wood selling.

Our results show maximum BP estimation in non-industrial eucalyptus plantations. Among pulp properties, stands between 6 and 9 years are the most exposed, based on BP and FS. Very large wildfires (FS ≥ 5000 ha) can potentially occur in 53% of the landscape, affecting 75% of the area of young industrial eucalyptus (0–5 years). About 30% of the industrial productive area showed risk above 100 EUR/ha. The 90th percentile of the risk values ranges from 227 to 445 EUR/ha, corresponding to 9% of the productive area. This information can support science-driven wildfire prevention plans at the landscape and industrial scale.

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