Assessing economical losses in pulp industry properties due to large wildfires in central Portugal

Beatriz Lourenço, Bruno A. Aparício, Chiara Bruni*, Akli Benali, Ana C.L. Sá

Background
In the last decades Mediterranean countries have been facing an increase of wildfire intensity and frequency. Portugal is no exception, reporting extremely severe wildfire seasons, causing fatalities and losses for millions of euros. Fire spread and behaviour simulations have been used worldwide to assess wildfire exposure and risk and to produce relevant information to support wildfire management decisions.

Objectives
This study aims to assess, for the year of 2021:

a) landscape-scale exposure of pulp industrial properties to large wildfires (>1 000 ha) spreading under extreme (97th percentile) weather conditions;
b) wildfire risk in production eucalypt plantations, as annual economic losses.

Conclusions
This study identifies and locates the most likely exposed properties to large wildfires, as well as the estimated losses derived from spreading fires under extreme weather conditions. It provides relevant information to support landscape fuel and fire suppression management decisions under competing resources.

Flowchart

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1: Eucalypt plantations younger than 10 years are likely exposed to wildfires. Within 1-km neighborhood, the highest BP values are in non-industrial eucalypts</td>
<td>This study aims to assess, for the year of 2021: a) landscape-scale exposure of pulp industrial properties to large wildfires (&gt;1 000 ha) spreading under extreme (97th percentile) weather conditions; b) wildfire risk in production eucalypt plantations, as annual economic losses.</td>
</tr>
<tr>
<td>Zone 2: Plantations older than 10 years are located in areas with larger FS values. Large and intense wildfires in the neighborhood are in non-industrial eucalypt plantations</td>
<td></td>
</tr>
<tr>
<td>Zone 3: All properties are very likely exposed to large wildfires, where pastures in the neighborhood are associated with the highest landscape values of BP and FS</td>
<td></td>
</tr>
</tbody>
</table>

Fire Size (ha)

Conditional Flame Length (m)

Annual Burn Probability

Annual Burned Area

Annual Economic Loss ($/ha)

<table>
<thead>
<tr>
<th>0 - 4</th>
<th>4 - 7</th>
<th>7 - 15</th>
<th>15 - 25</th>
<th>25 - 40</th>
<th>40 - 60</th>
<th>60 - 89</th>
<th>89 - 141</th>
<th>141 - 665</th>
</tr>
</thead>
</table>

45 000 ha industrial properties | 80% production

Fourty percent of the study area shows burn probability larger than 2%

Sixty percent of the study area shows the potential to spread fires larger than 5 000 hectares

Twenty percent of the study area shows conditional flame length values longer than 2.5 meters (control efforts at the fire head probably are ineffective)

7% within the highest-range class of annual economic losses

Funding: This study was funded by the Forest Research Centre unit (UIDB/00239/2020) and the foRESTER project (POCI/01/0145/FEDER-030241) both funded by Fundação para a Ciência e a Tecnologia I.P. (FCT). A.S. was supported by the research contract DL57/2016/CP1382/CT0003; A.B. was supported by the research contract CEECIND/03799/2018/CP1563/CT0003; B.A. was supported by the Ph.D. Fellowship funded by FCT (IF/BD/150755/2020).