OptiFuel: A Multi-Criteria Web-GIS Tool for Optimizing Fuel Treatment Scenarios in Fire-Prone Landscapes

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As climate change intensifies wildfire regimes across Europe, the strategic allocation of fuel treatment projects is increasingly essential. Within this context, OptiFuel platform was developed as a web-based decision-support application that enables spatial prioritization of fire mitigation strategies. Built using the ArcGIS Online platform [1-2], OptiFuel supports dynamic scenario planning through the lenses of a) Efficiency, b) Equity, and c) Trade-Offs, providing a tailored analytical interface for visualizing and filtering exposure sources across diverse landscapes.

The web application was developed as part of the FIRE-RES EU-funded project and is linked directly to its Living Labs initiative. Upon launch, users are introduced to FIRE-RES's objectives and can select one of five regional applications: Peloponnese (Greece), Bio Bio (Chile), Vale do Sousa (Portugal), Catalonia (Spain), and Nouvelle-Aquitaine (France). Each region includes fire simulation outputs and geospatial data specific to local vegetation, communities, and protected areas. A guided tutorial assists users in navigating the interface, enhancing accessibility for both technical and non-technical stakeholders. The platform integrates exposure data with stochastic fire spread simulations, offering a robust, user-friendly interface for planning and prioritization.

The Efficiency and Equity modules of the OptiFuel web application allow users to filter fire exposure data by year of implementation or rank per Forest Service district, respectively, across three key sources: 1. community exposure, 2. protected area exposure, and 3. high-probability ignition zones. This supports both temporal and spatial analyses of treatment prioritization. The Trade-Offs module [3] enables comparative scenario analysis by allowing users to select between two fire exposure scenarios and apply weighted criteria to rank objectives such as biomass, hazard, and exposure sinks. Together, these functions provide a multi-dimensional view of fire risk to inform balanced and transparent fuel treatment planning. Additionally, the platform includes measurement tools, basemap customization, and boundary selection (e.g., forest districts services or municipalities), allowing fine-grained spatial control and cartographic clarity.

OptiFuel aims to strengthen wildfire resilience by enabling stakeholders to visualize fire risk, simulate outcomes, and compare trade-offs. The tool supports science-informed decision-making at multiple governance levels [4]. Its application in the FIRE-RES Living Labs highlights the

importance of integrating spatial planning tools into collaborative fire management strategies across Europe's most fire-prone regions.

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