Climate services for forest fire risk management : the RiskFP platform

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RiskFP description

RiskFP is a **geospatial web-based decision tool** developed to support both forest managers and forest insurance actors in managing the vulnerability of their assets/portfolios to fire risk. RiskFP includes four main "operational" services.

The main service consists in **the generation of "fire realistic disaster scenarios"** that can be used **to complete information from historical event set** and to **compute probable maximum loss (PML)**. It includes also impact calculation like the amount of biomass burnt and CO_2 release.

The other services provide **general information** which aims at **raising knowledge on the risk level in a specific region**. These risk representations are:
- Risk mapping;
- Forecasting of the frequency of fire critical days in the next season and next climate slice ;
- Risk reduction scenarios at the junction of forest and cities (WUI);

RiskFP has been tested by **several users** (mainly forest managers, insurers and fire-fighters) in **several regions worldwide**: Brazil, Chile, South Europe, and Australia.

Demonstration zone
Victoria, AUSTRALIA,

Zone 1 – West of Sydney

Zone 2 – East of Melbourne

Zone 3 – Walhalla
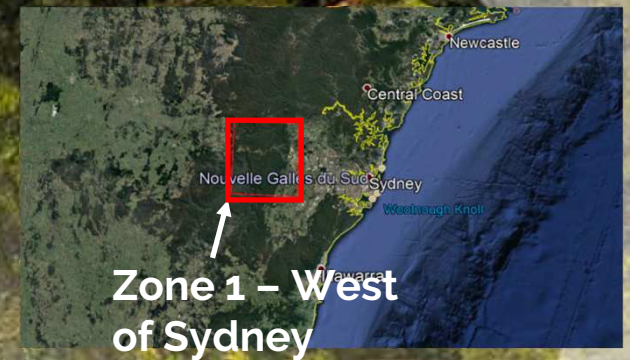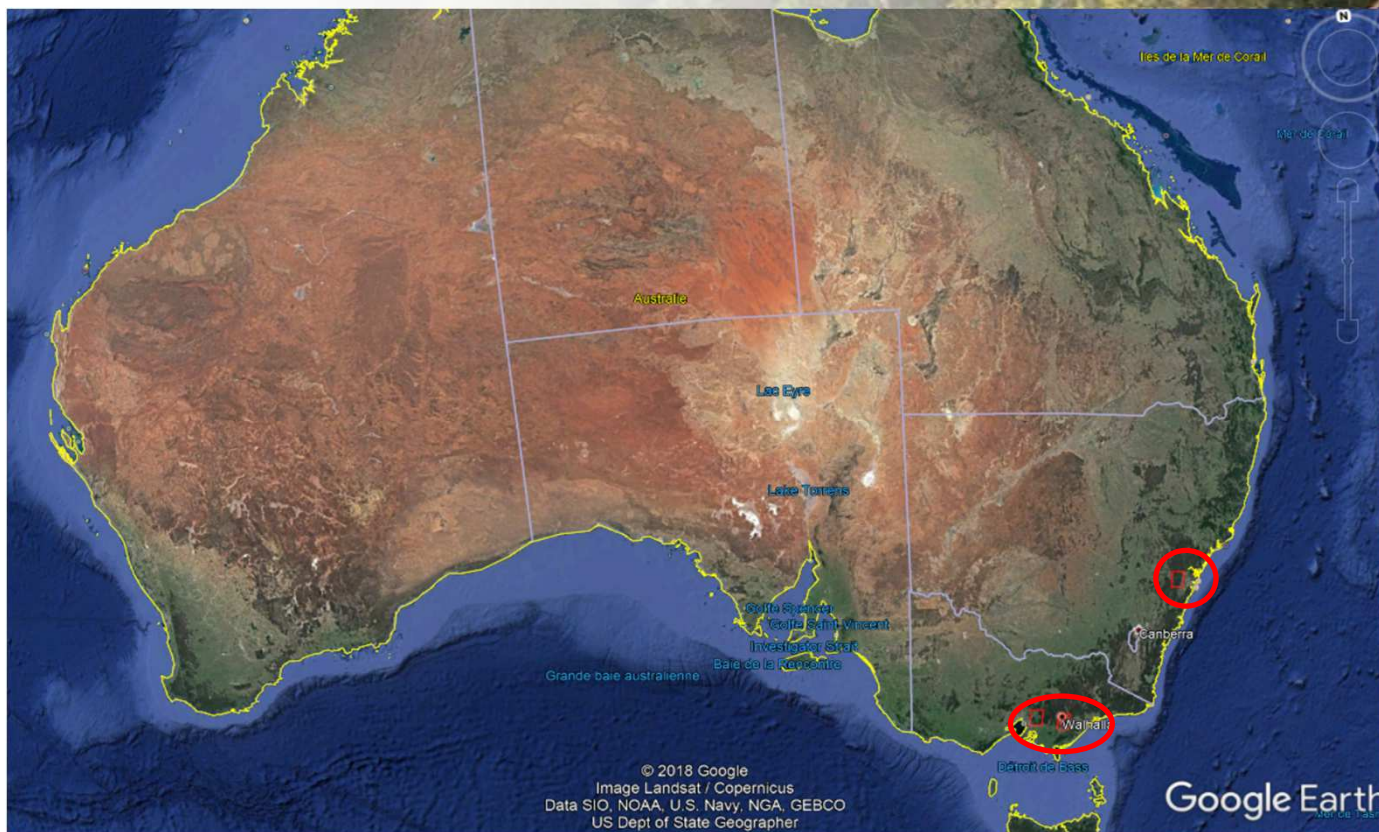
Demonstration zone
Victoria, AUSTRALIA,

Unit = 50km x 50km zone

Central Gippsland north of the Morwell-Traralgon basin

Walhalla

Critical Landscape Weather Patterns

This concept lies at the heart of the platform.

"Critical landscape fire weather pattern" is an **empirical fire weather index that identifies severe-extreme fire weather days**. It is defined based on:

- **Fire risk factors related to critical fuel and fire weather conditions** for a severe-extreme bushfire. Three fire risk factors are used. Specific thresholds used as **triggering criteria** have been calibrated to the zone.
- **Criteria of exposure duration** in hours on a given day.

The indicator is derived from **hourly or half-hourly records at a representative weather station** of the given zone.

It is used for:
- **pre-selecting days for the RDS generator and for the risk mapping service**
- the forecasting and projection service as a basis indicator

Critical Landscape Weather Patterns
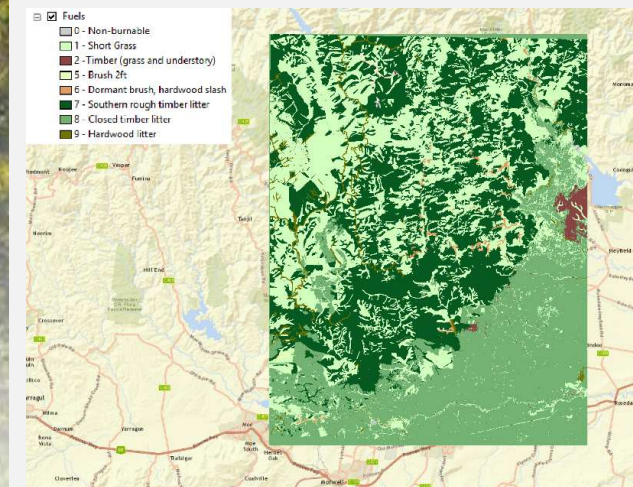## Illustration
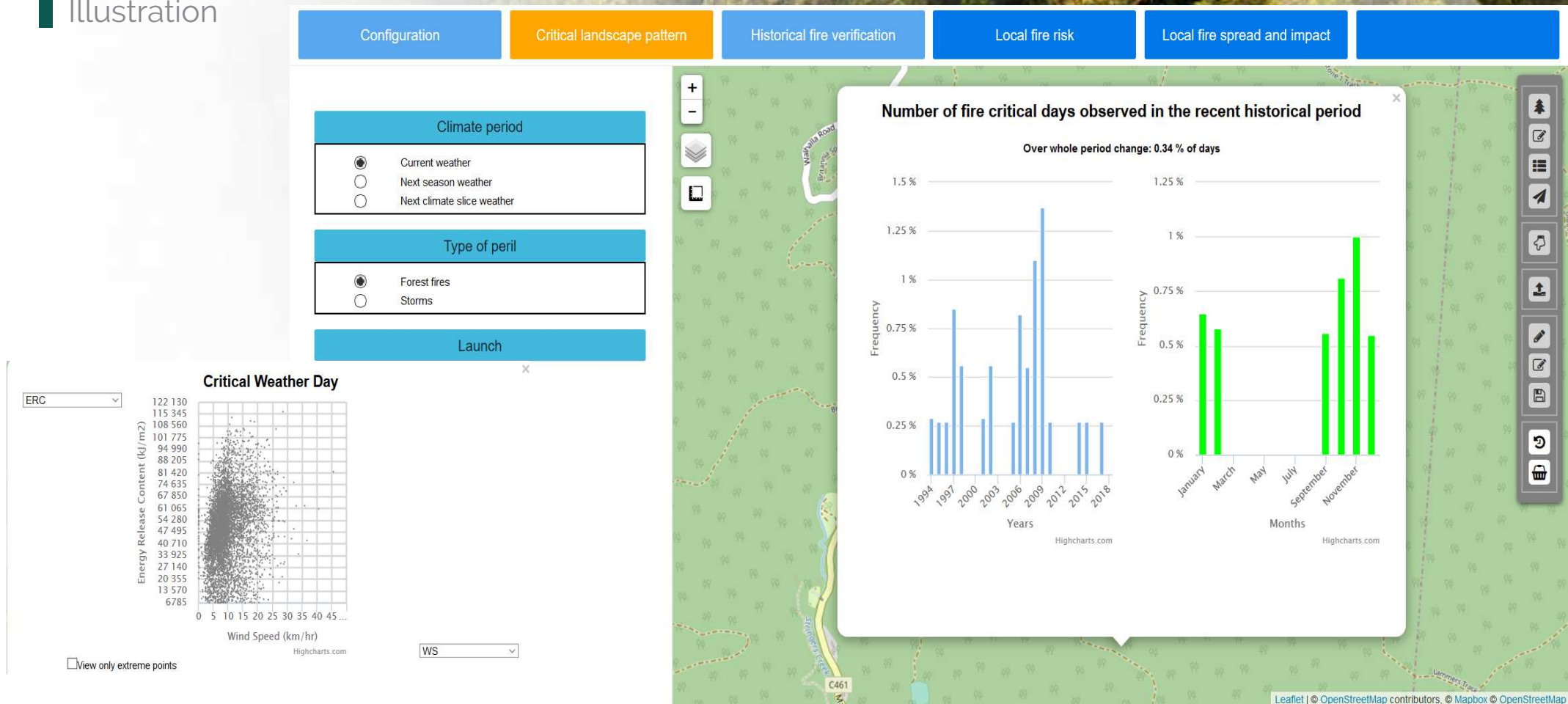
Realistic Disaster Scenarios generator
Methodology

It is based on 2 main components:

1) **"Critical landscape fire weather patterns**"

2) **A propagation model** that allows **estimating the progression and behavior of the fire in space and time**. Realistic disaster scenarios are simulated with the **Wildfire Analyst®** simulation software from Tecnosylva.
   - The **propagation model** of Wildfire Analyst is based on the standardized and validated semi-empirical **Rothermel** propagation model (1972).
   - Improvement of the model capabilities thanks to the participation to many R&D project since 2005

3) **Impact module**:
   - Calculation of the **GHGs emissions released** by the **fire scenario modelled**.
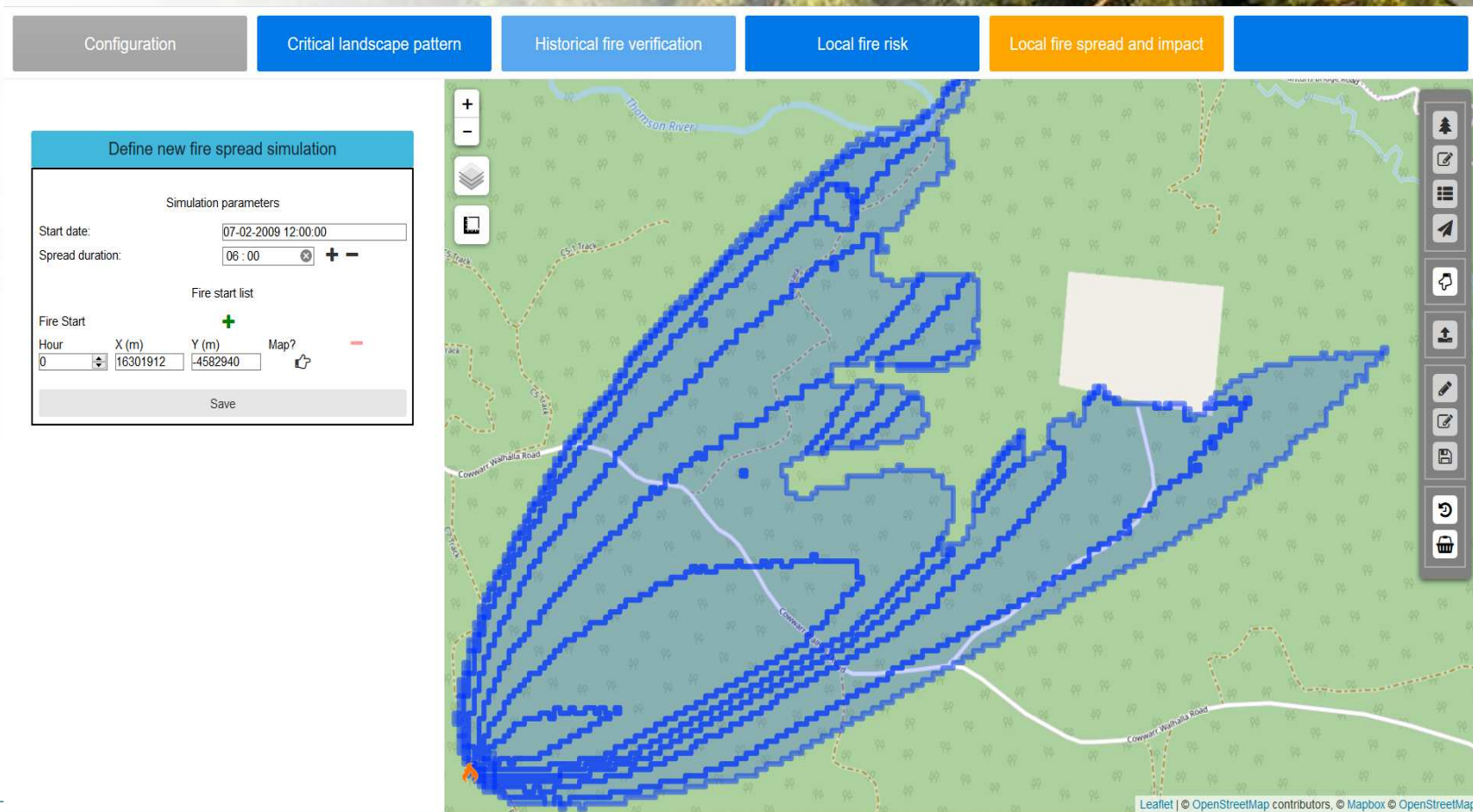   - Calculation of **other impacts and losses** possible **depending on data availability.**

Input data:

- Hourly weather data
- Fire ignition line / point
- Digital Elevation model
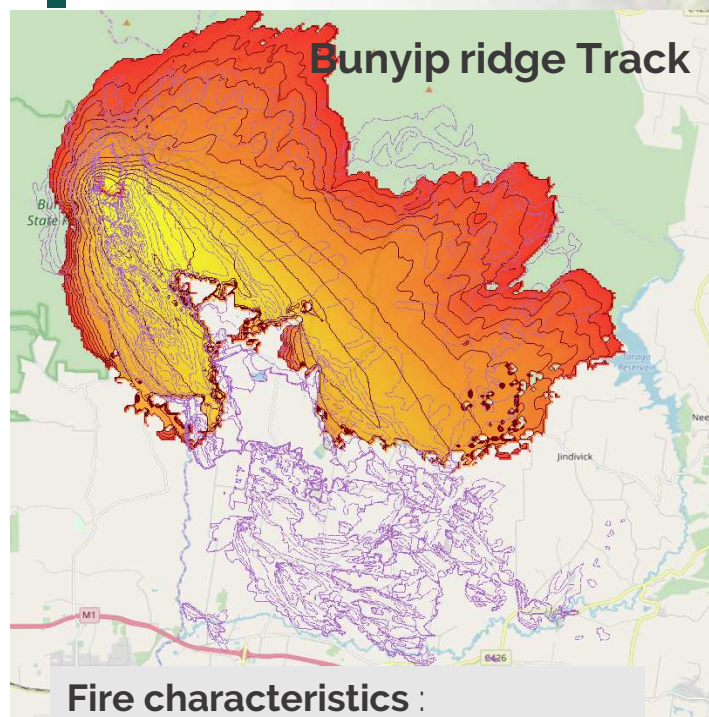- Vegetation fuels at high resolution (30m)

Fuels
- 0 - Non-burnable
- 1 - Short Grass
- 2 - Timber (grass and understory)
- 5 - Brush 2ft
- 6 - Dormant brush, hardwood slash
- 7 - Southern rough timber litter
- 8 - Closed timber litter
- 9 - Hardwood litter

Realistic Disaster Scenarios generator
Illustration

Realistic disaster scenarios
Validation for past fire events

Bunyip ridge Track

Name	Date	Start time	Finish time	Fire duration	Burnt area
Bunyip ridge Track	7/02/2009	12:00	22:30	10h	21 170 ha
Aberfeldy-Donnellys	17/01/2013	11:48	04:00 (18/01/2013)	16.25h	> 20 000 ha

Aberfeldy-Donnellys

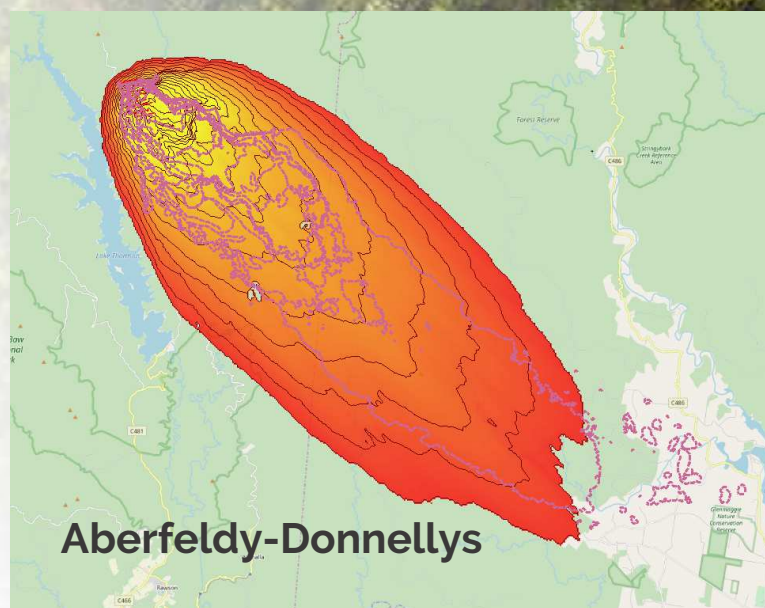**Fire characteristics** :

- **Wind direction changed from NW to SE** on the late afternoon from 17:30h on which intensified greatly the fire spread.

Fire characteristics:

- 2 wind speed regimes: **calmer local wind fields** channelled by the river and the valley (5-10Km/h which **then turned to a strong surface wind** (30-40Km/h) that **greatly increased the fire rate of spread**.

RiskFP : risk mapping service

- Provide a map giving an **overview of the critical areas with regard to the "easiness of the fire to spread"** in the case of ignition for a specific day.

- Structural Hazard Model is based on an equation that makes use of fire propagation results obtained with the **WildFire Analyst Rothermel propagation model.**

- The risk index includes 5 classes. It takes into account several fire propagation variables such as flame length, fireline intensity and rate of spread and it is computed for each cell grids.
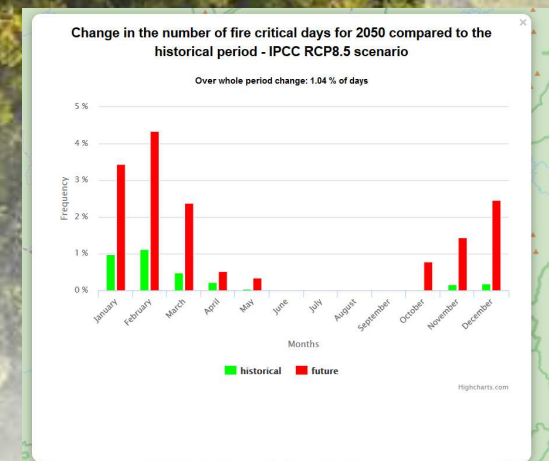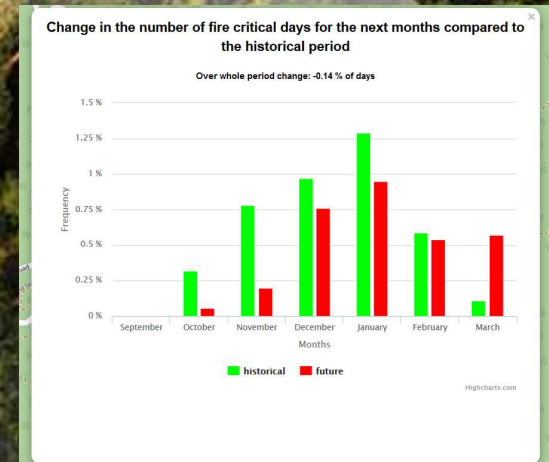

low
medium
high
severe
extreme
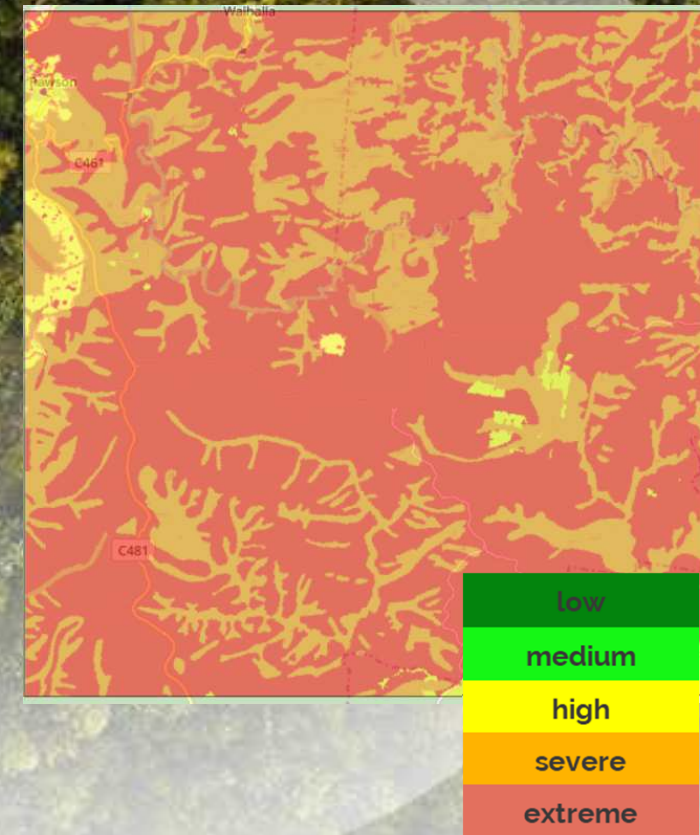
Seasonal Forecast and climate projections

Critical days frequency

Operational forecast to predict their potential exposure to fire risk at both **a seasonal** and **long-term horizons.** It provides information on the frequency of large fires.

It consists in **assessing the frequency of critical days during which weather conditions could lead to large fires** in the future period and to compare it to "normal" conditions.

- **Seasonal forecasts provided by the Copernicus Program** that are updated each month by ECMWF and the main European Met Offices.
- **Climate change scenarios provided by the International Community** (IPCC, CORDEX) and that allow to take into account the evolution of weather conditions due to climate change over a long-term horizon

Change in the number of fire critical days for the next months compared to the historical period

Over whole period change: -0.14 % of days

Change in the number of fire critical days for 2050 compared to the historical period - IPCC RCP8.5 scenario

Over whole period change: 1.04 % of days

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Thank you for your attention!

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