



Fire risk assessment, reduction and adaptation: Experiences from the FirEUrisk H2020 project

Emilio Chuvieco

Environmental Remote Sensing Research Group,
Universidad de Alcalá (Spain)

emilio.chuvieco@uah.es

On behalf of the FirEUrisk consortium



FirEUrisk project objectives

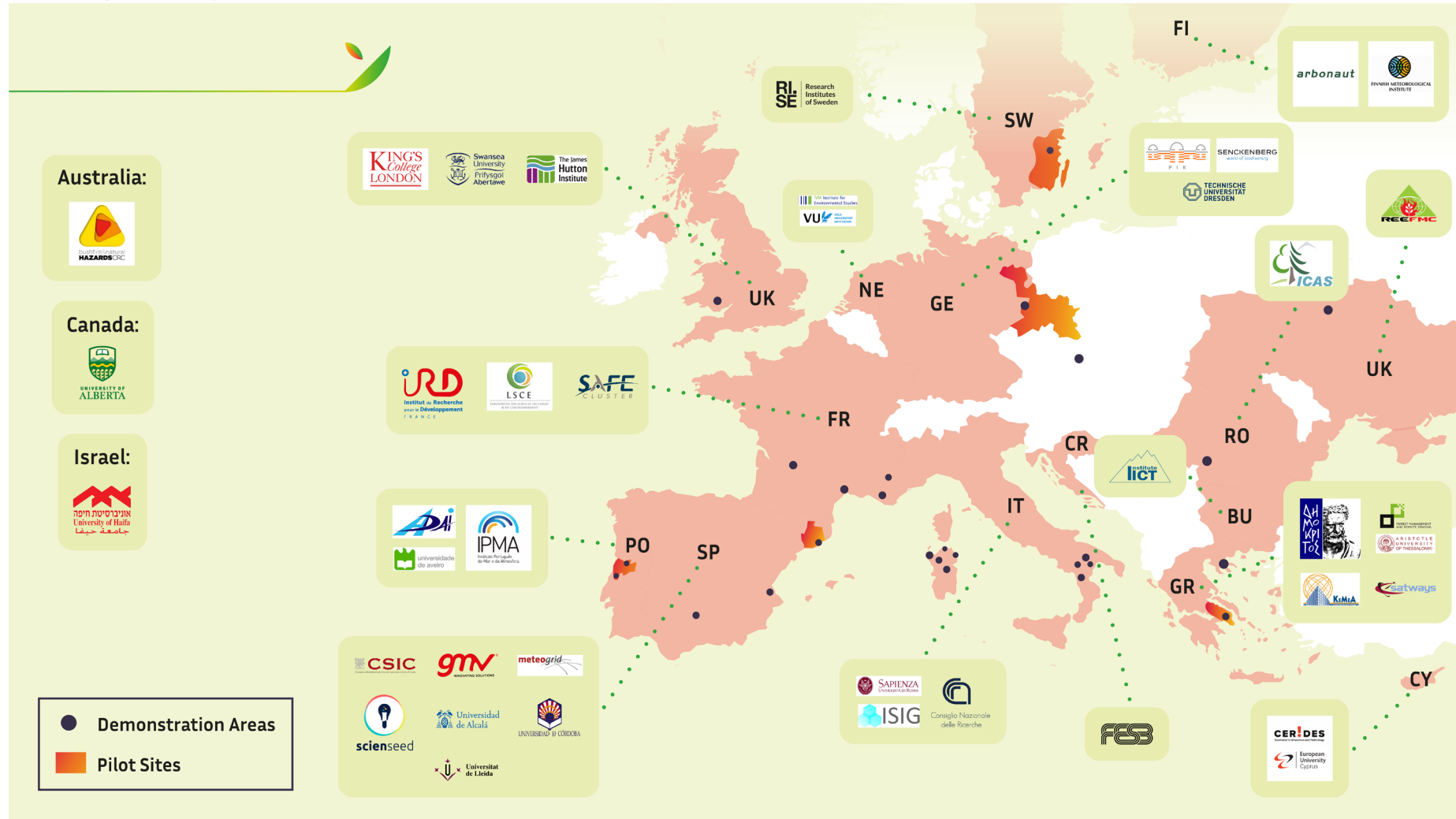
1. Expand the capabilities of existing wildfire **risk assessment** systems.
2. Use risk-assessment to drive wildfire management and **reduce current fire risk conditions**.
3. **Adapt fire management strategies** to expected future climate and socio-economic changes.
4. **Integrate** all fire management phases and activities.



This project has been granted funding from the European Union's Horizon 2020 research and innovation programme



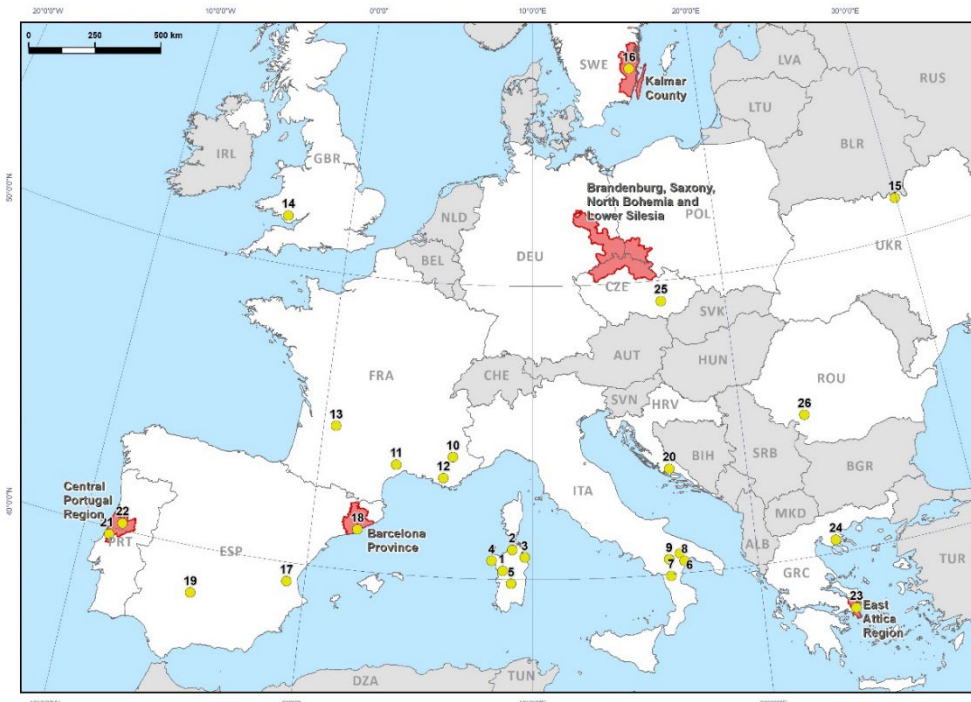
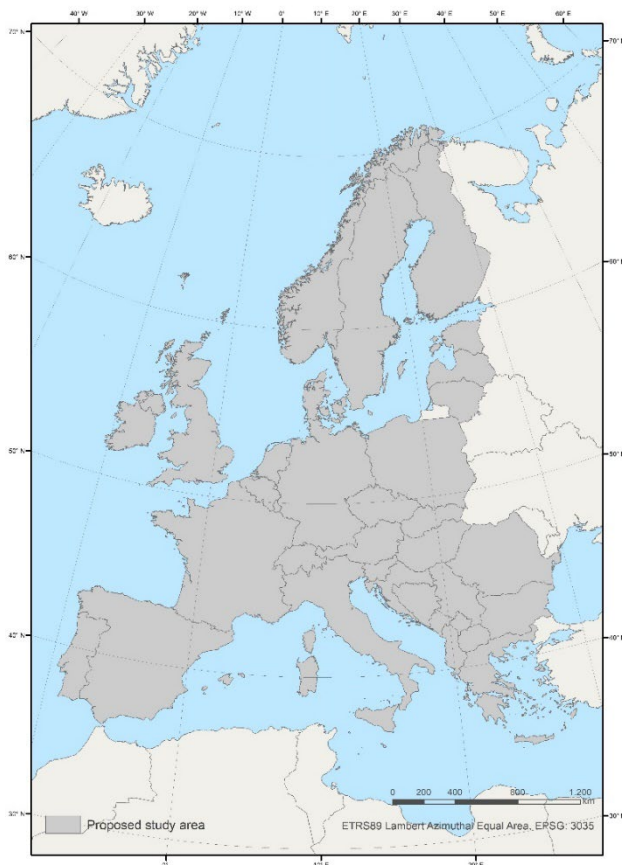
Project partners



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FirEUrisk Spatial Integration

- Spatial resolution: ET: 1 km; PS: 1 ha (↑). WP3 9x9 km.
- Same cartographic projection: ET (LAEA); PS (UTM) (↑↓).

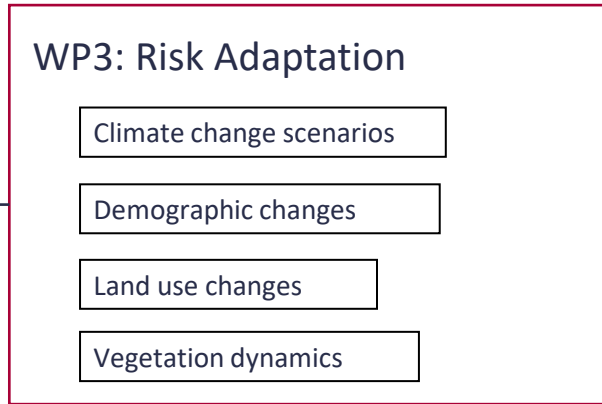
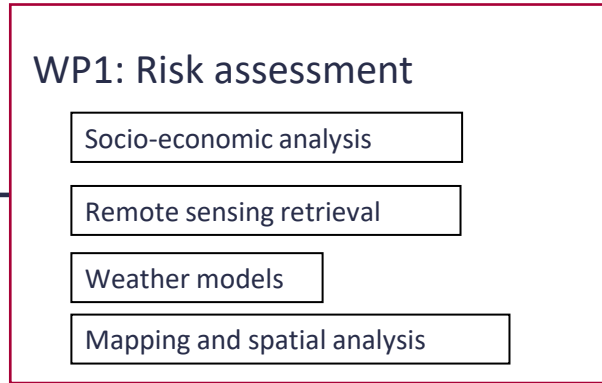
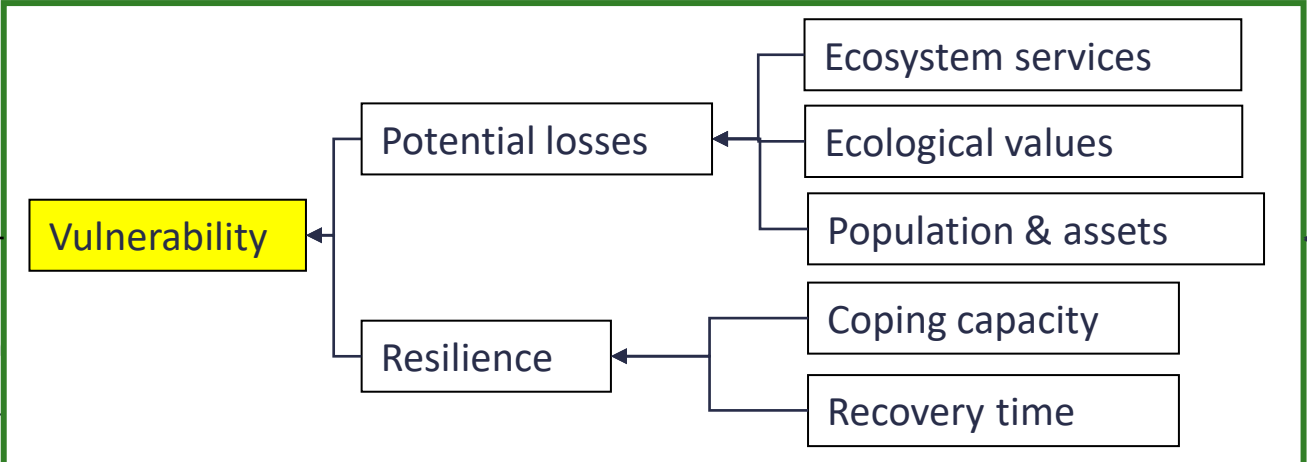
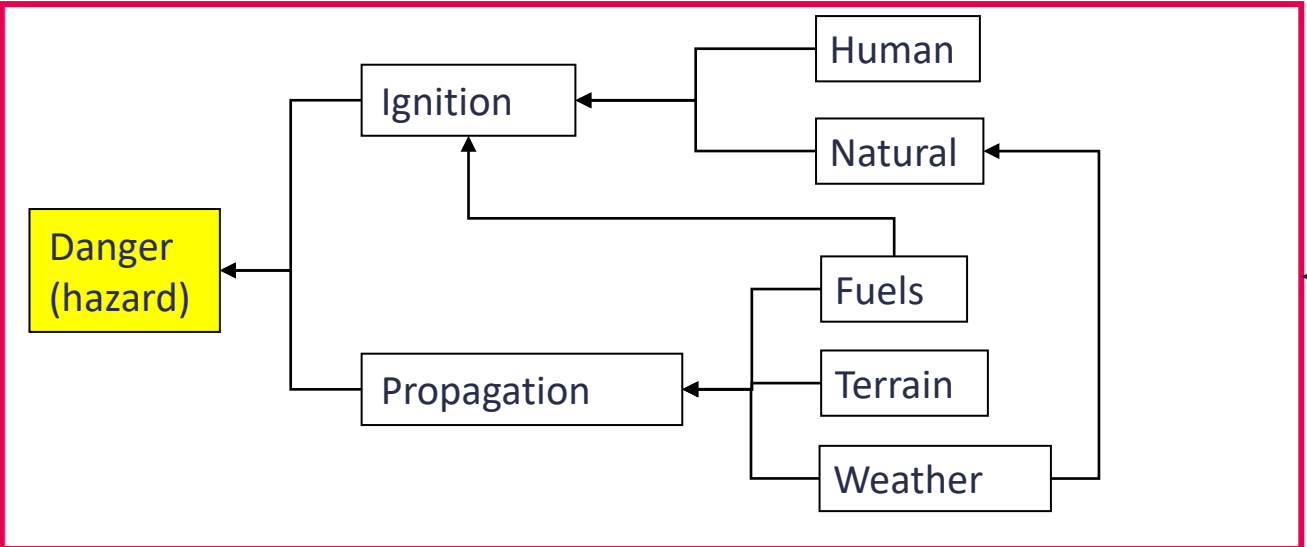
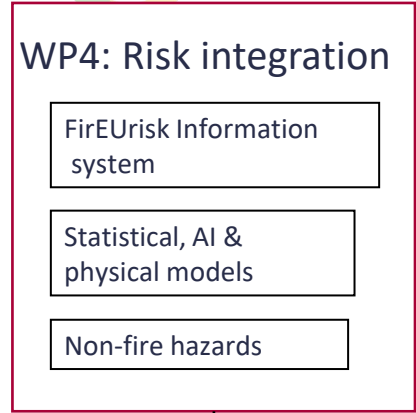


26 DA → WP 1-4

5 PS → WP 5: Sweden, Central Europe [Germany, Poland, Czech Republic], Portugal, Spain, Greece.



FirEURisk conceptual integration among WPs

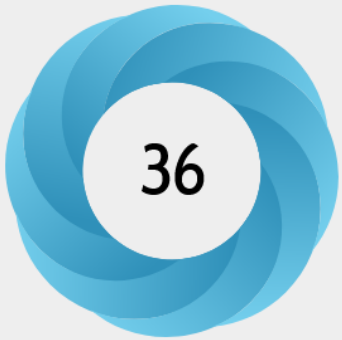
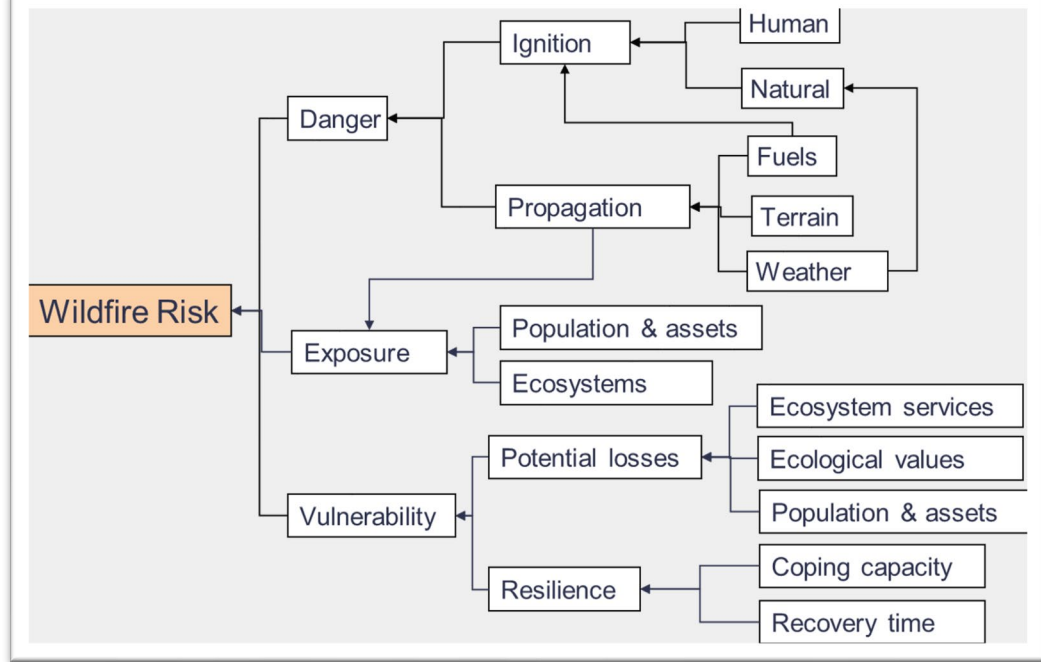


Wildfire Risk

WP5: Demonstration

WP6: Dissemination

6 FirEurisk Integration Scheme



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High Attention Score compared to outputs of the same age (93rd percentile)

High Attention Score compared to outputs of the same age and source (94th percentile)

Open Access **Editor's Choice** Concept Paper

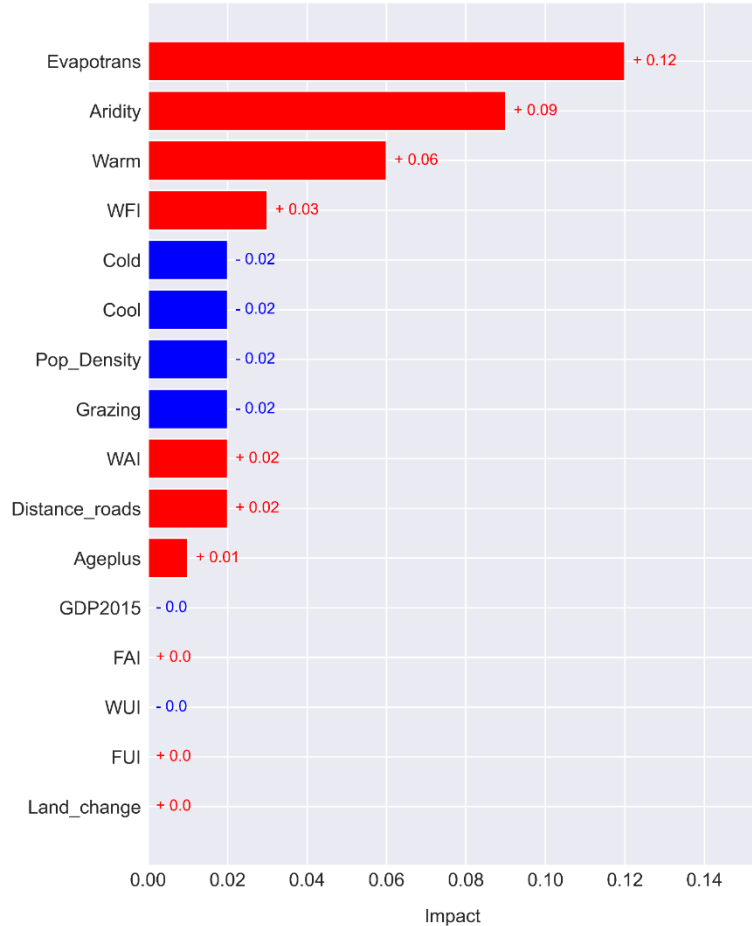
Towards an Integrated Approach to Wildfire Risk Assessment: When, Where, What and How May the Landscapes Burn

by Emilio Chuvieco ^{1,*} , Marta Yebra ^{2,3} , Simone Martino ⁴ ,
 Kirsten Thonicke ⁵ , Marta Gómez-Giménez ⁶ , Jesus San-Miguel ⁷ ,
 Duarte Oom ⁷ , Ramona Velea ⁸ , Florent Mouillot ⁹ , Juan R. Molina ¹⁰ ,
 Ana I. Miranda ¹¹ , Diogo Lopes ¹¹ , Michele Salis ¹² , Marin Bugarcic ¹³ ,
 Mikhail Sofiev ¹⁴ , Evgeny Kadantsev ¹⁴ , Ioannis Z. Gitas ¹⁵ ,
 Dimitris Stavrakoudis ¹⁵ , George Eftychidis ¹⁵ , Avi Bar-Massada ¹⁶ , + Show full author list

¹ Environmental Remote Sensing Research Group, Department of Geology, Universidad de Alcalá, Geography



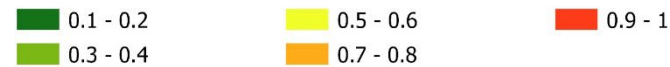
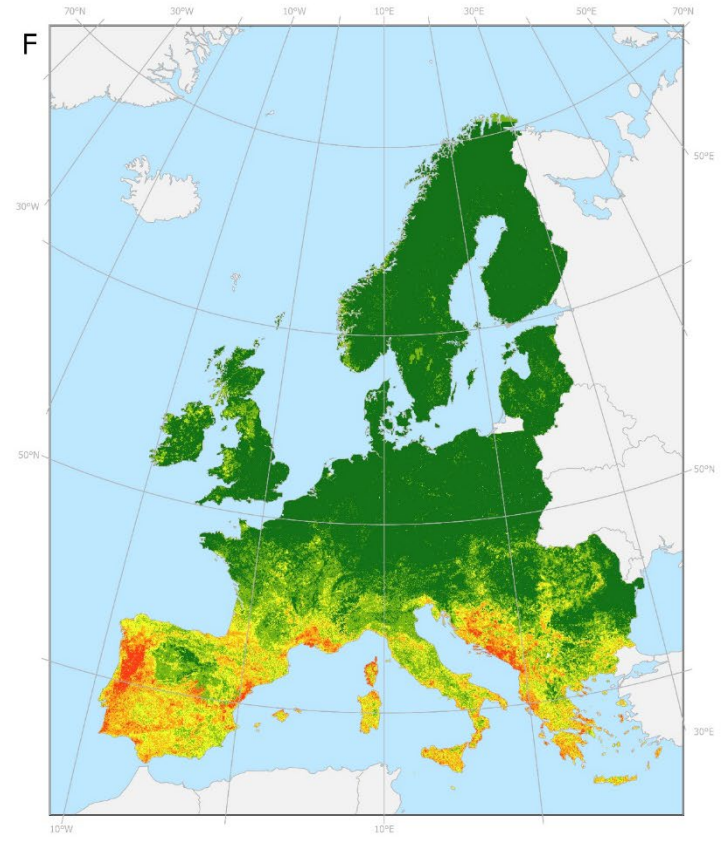
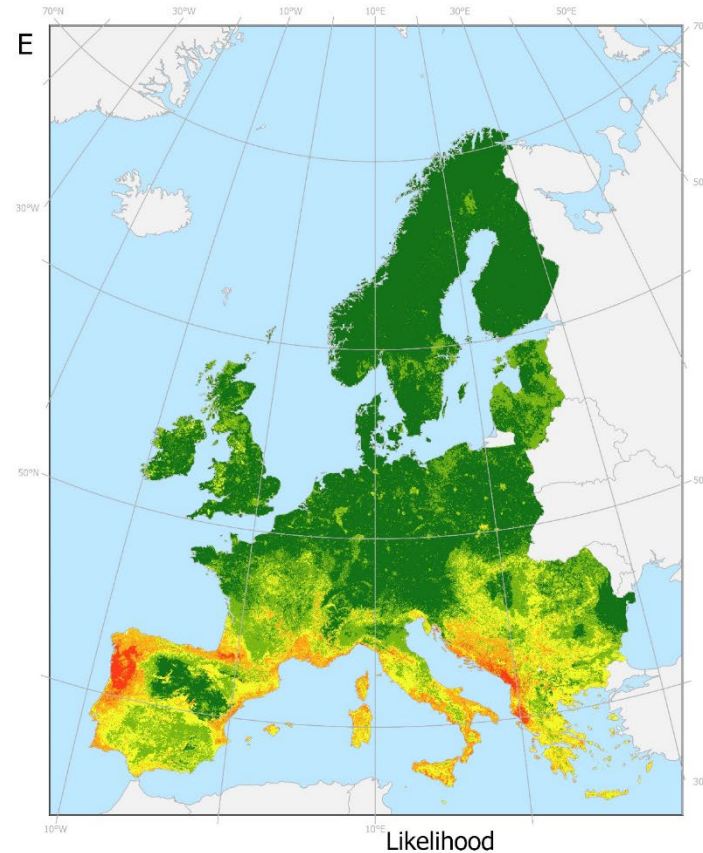
Ignition probability (U. Alcalá)



Mix models

(E) Fires > 100 h

(F) Fires > 1000 ha.



ETRS 1989 Lambert Azimuthal Equal Area

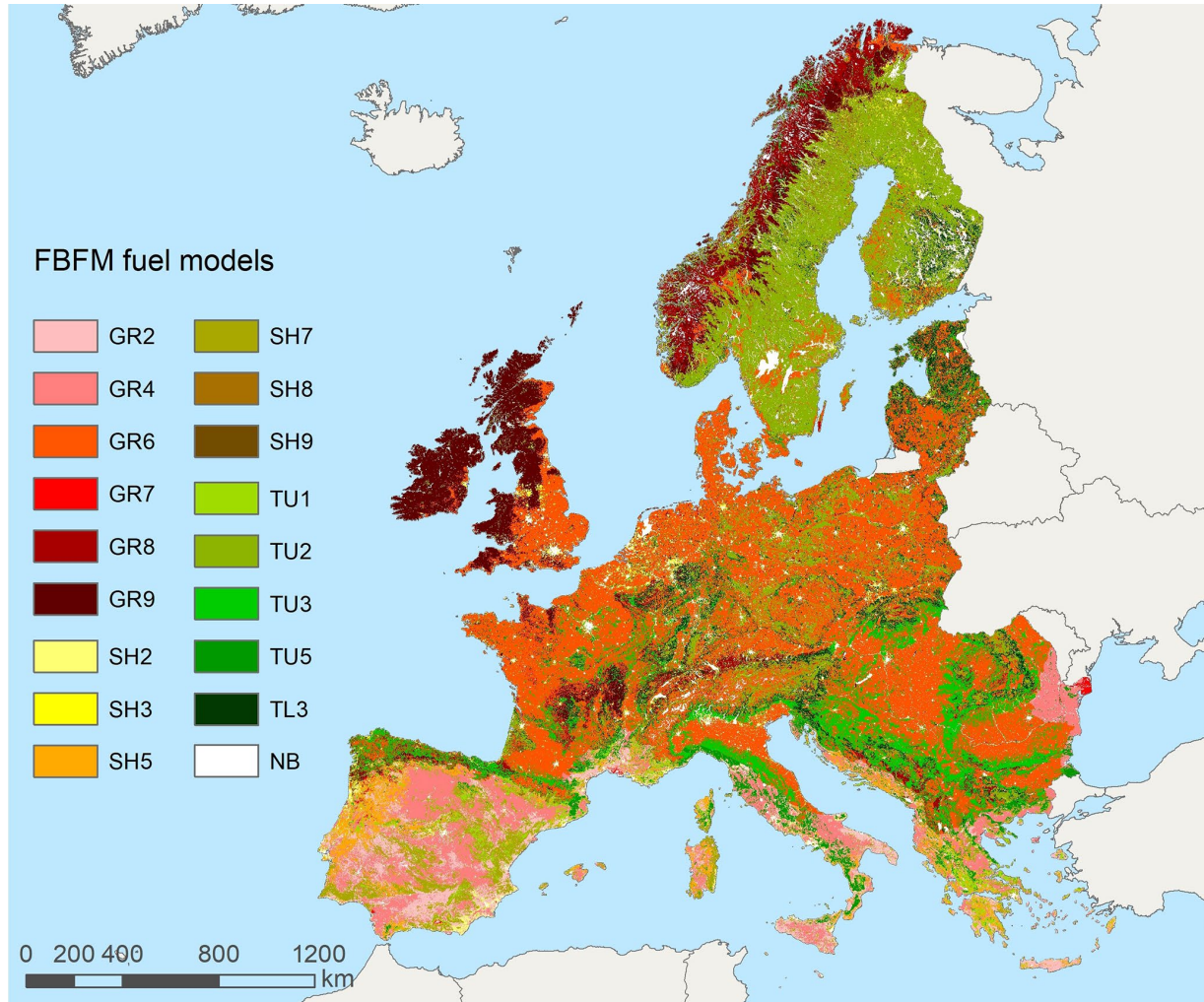


This project has been granted funding from the European Union's Horizon 2020 research and innovation programme

Ochoa et al, 2024 STOTEN

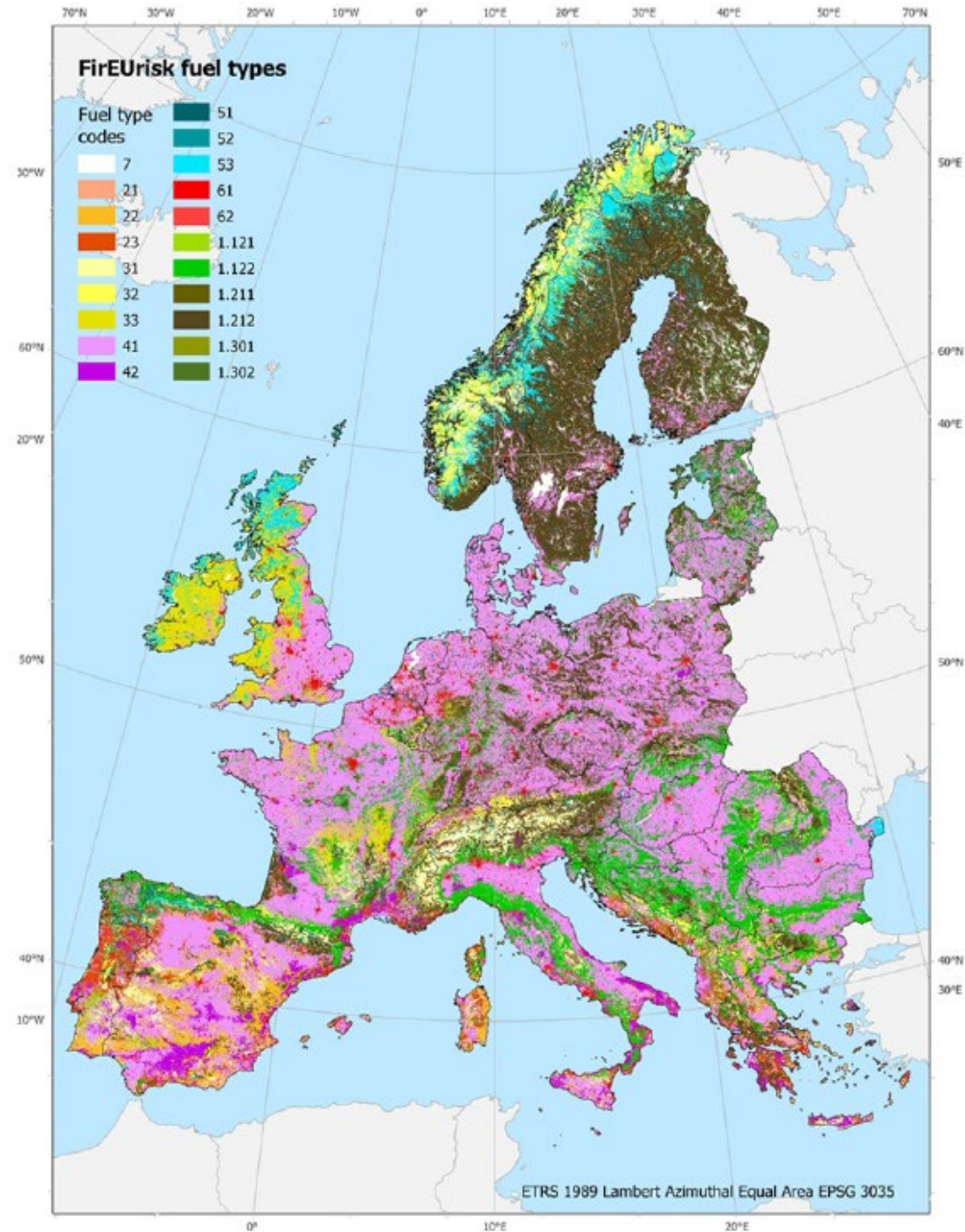


European fuel mapping (U. Alcalá)



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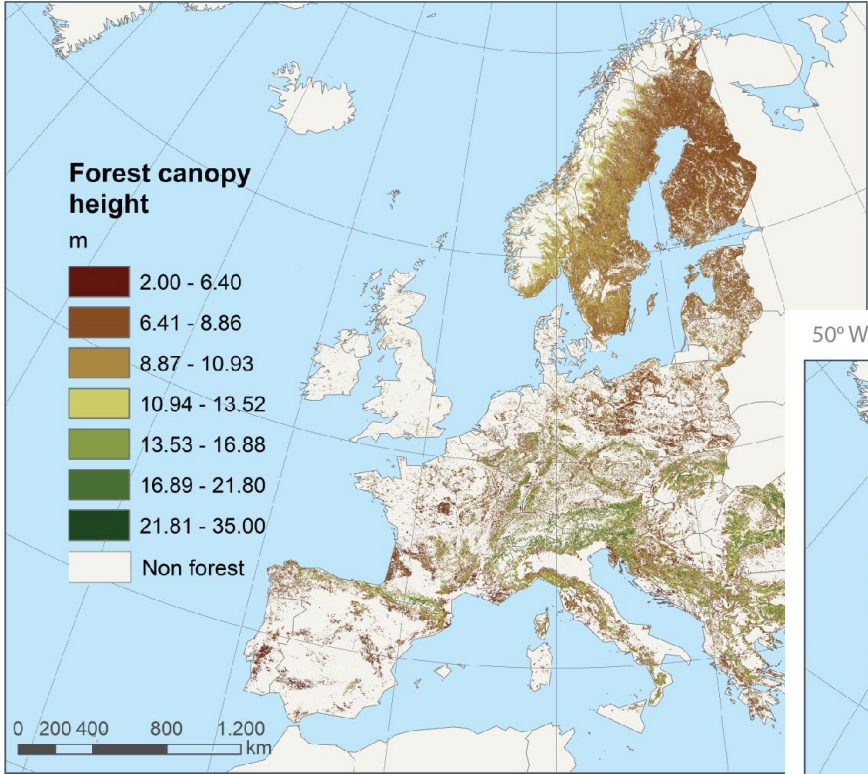
Aragoneses et al. 2023 ESSD



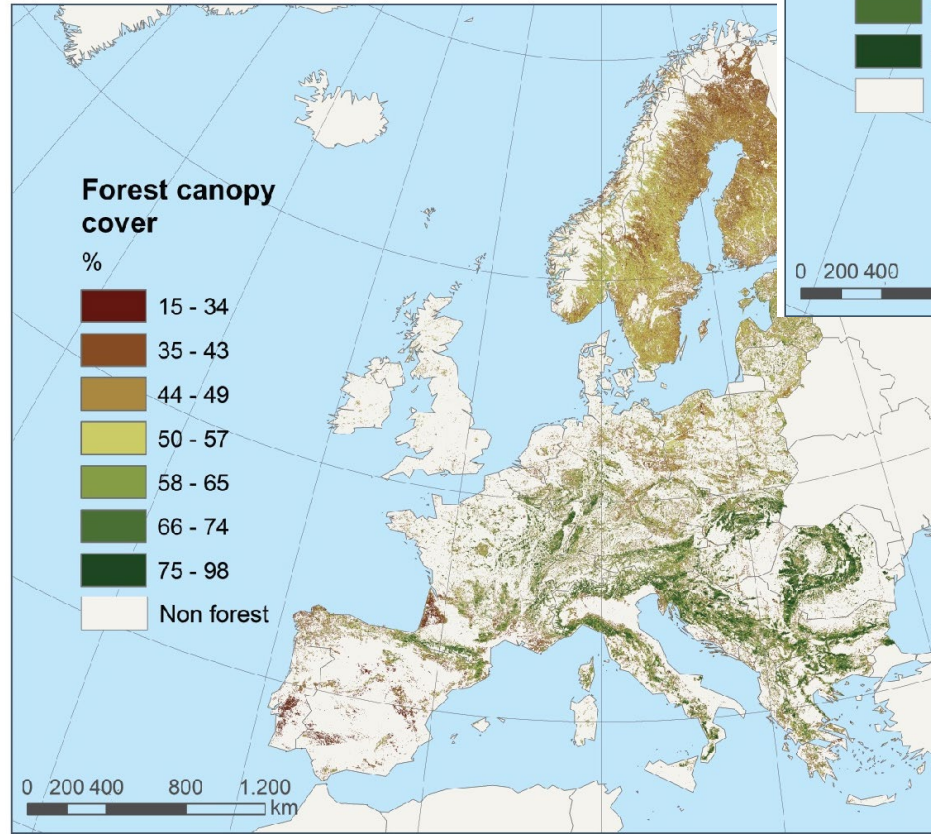


Canopy fuel parameters

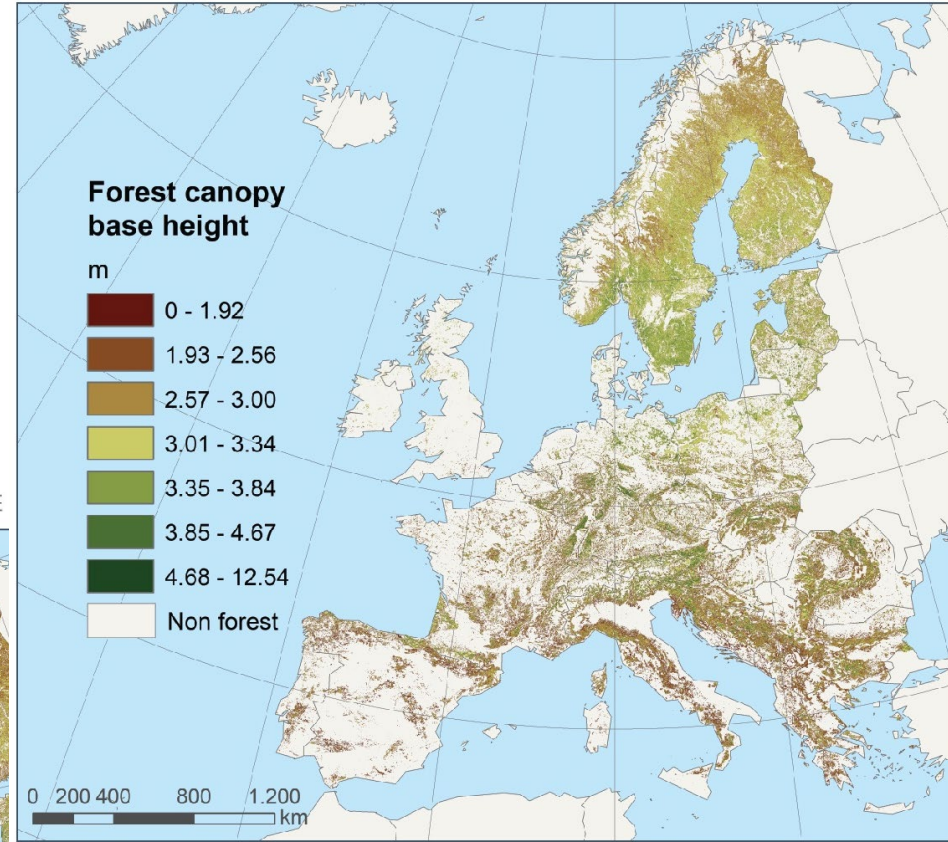
50°W 40°W 30°W 20°W 10°W 0° 10°E 20°E 30°E 40°E 50°E



50°W 40°W 30°W 20°W 10°W 0° 10°E 20°E 30°E



50°W 40°W 30°W 20°W 10°W 0° 10°E 20°E 30°E 40°E 50°E



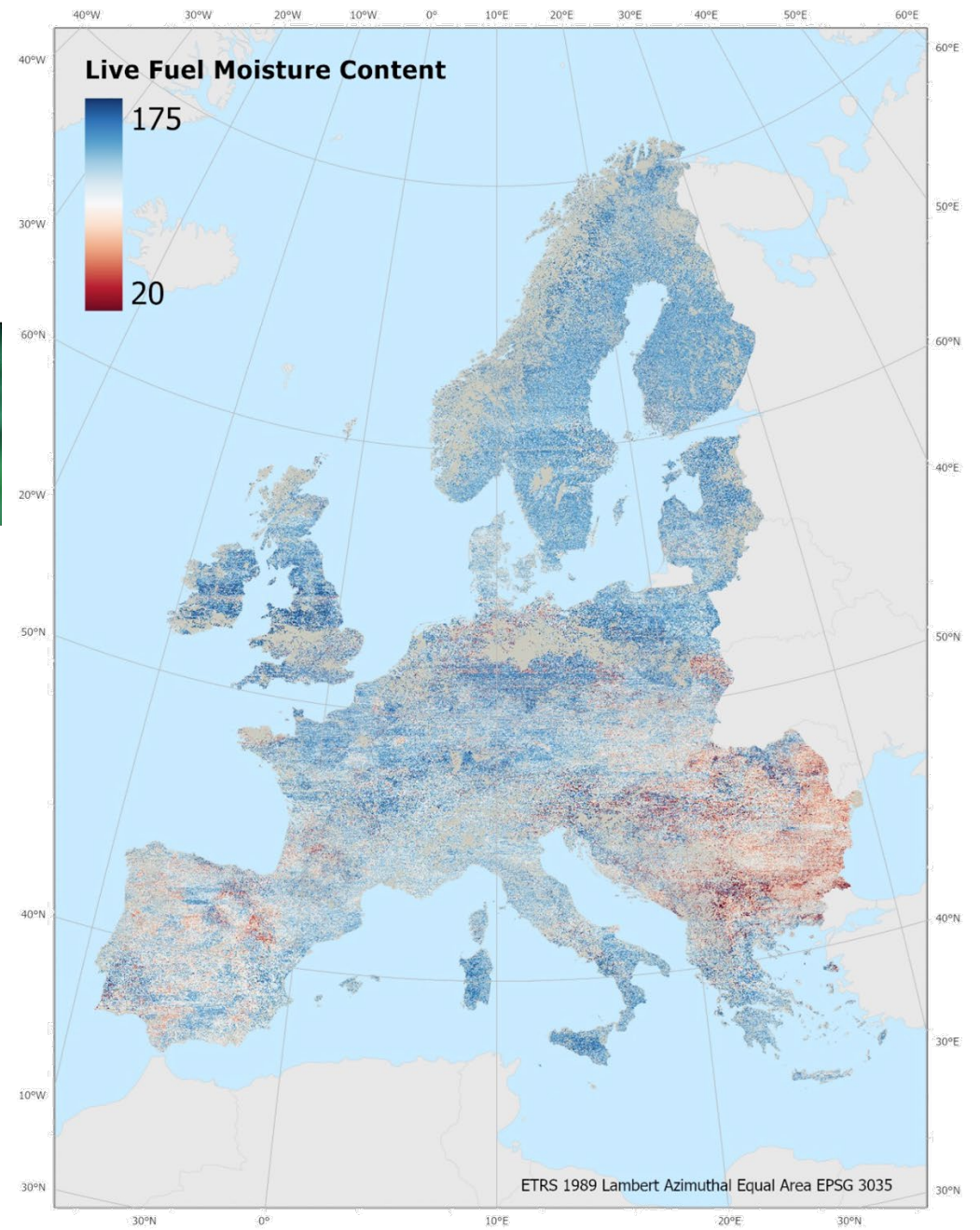
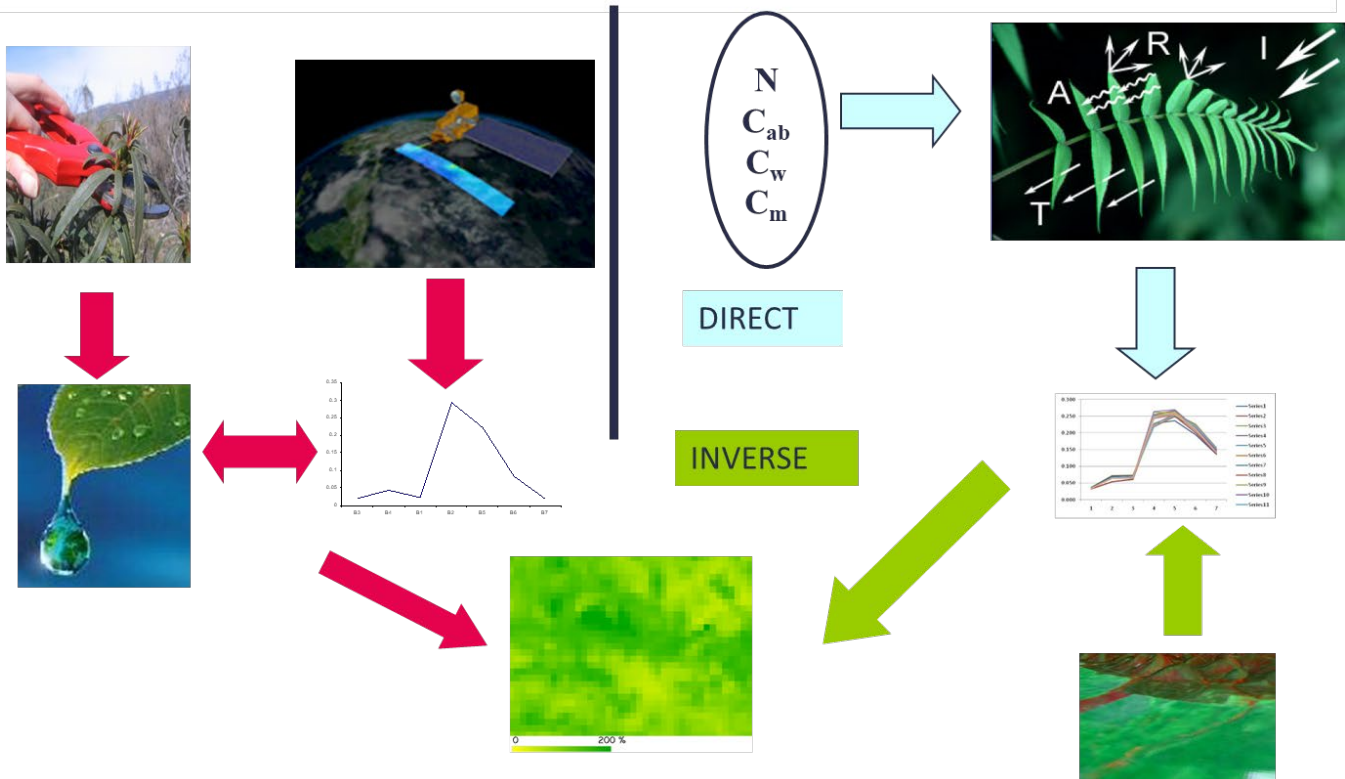
Aragoneses et al. 2024 RSE



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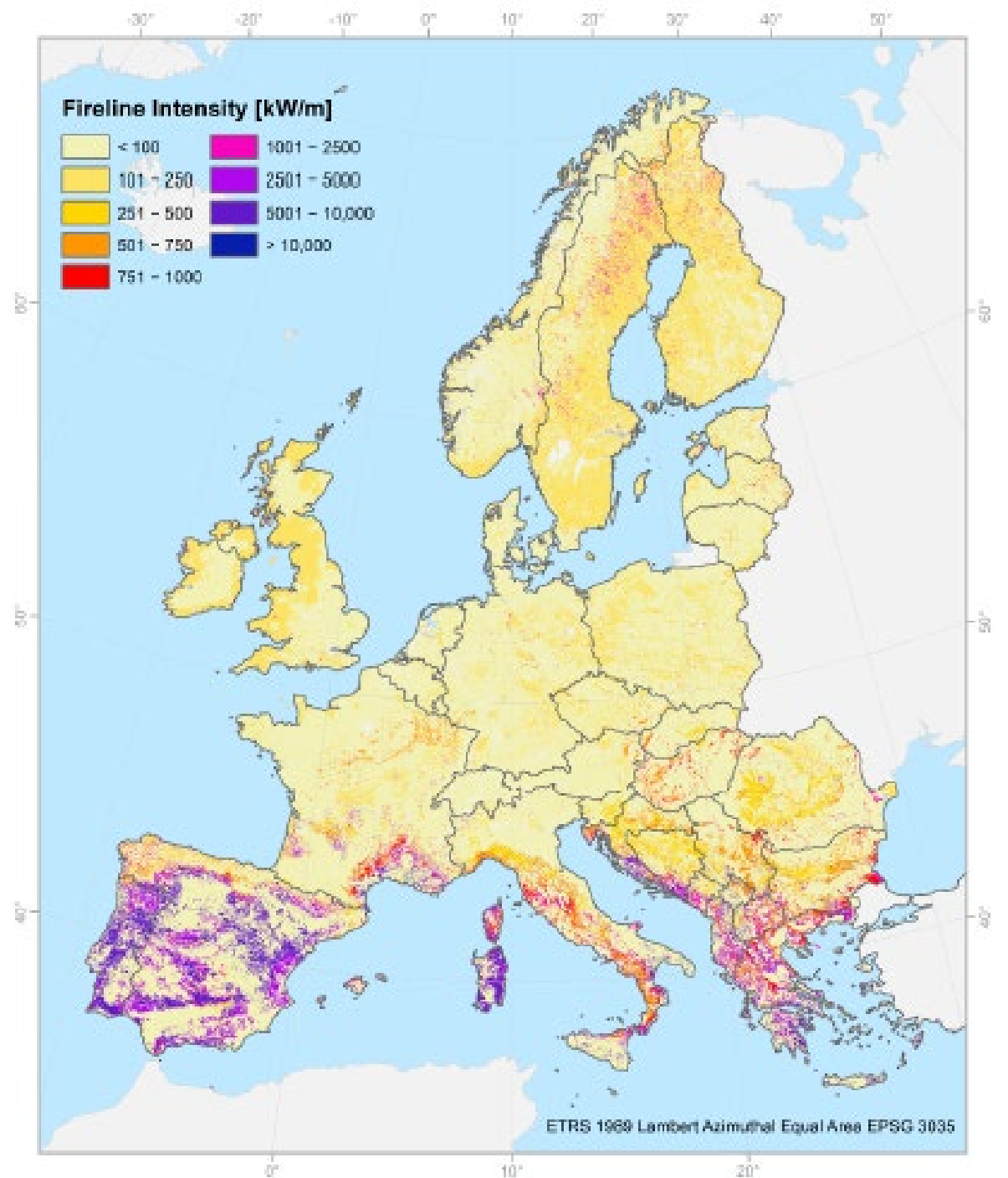
Live Fuel moisture content (U. Sapienza)



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Propagation (University of Split, Croatia)

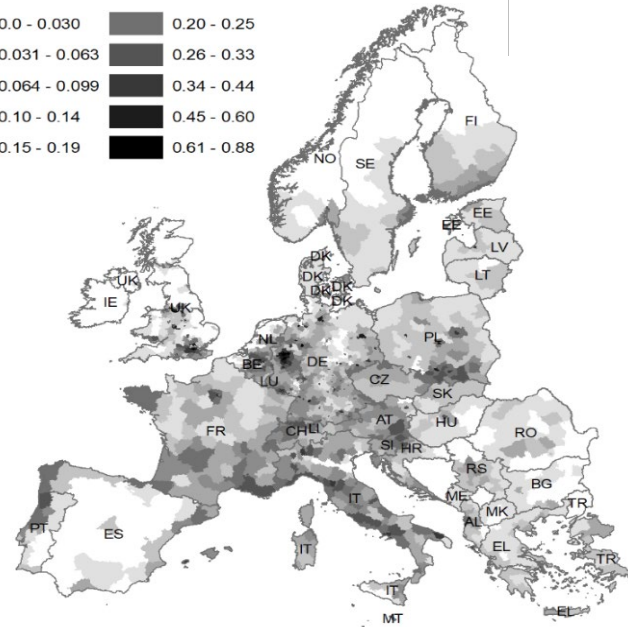
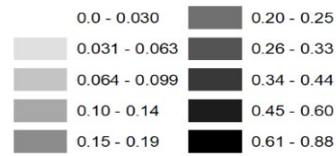
- Extreme fire weather scenario:
 - 95% weather conditions for days when any fire > 1000 ha occurred in Europe.
- Rothermel's model surface fires:
- Adaptation to Crown fires.



Exposure (Univ Haifa, Is)

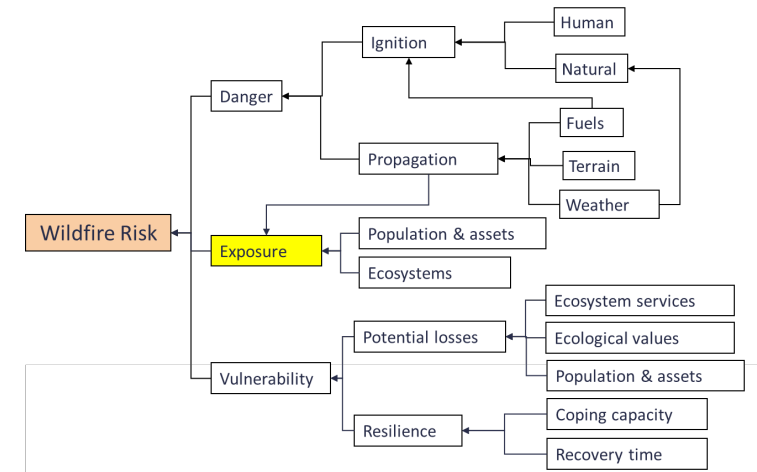


WUI (2020)



Proportion of total WUI in NUTS-3

Bar Massada et al. 2022

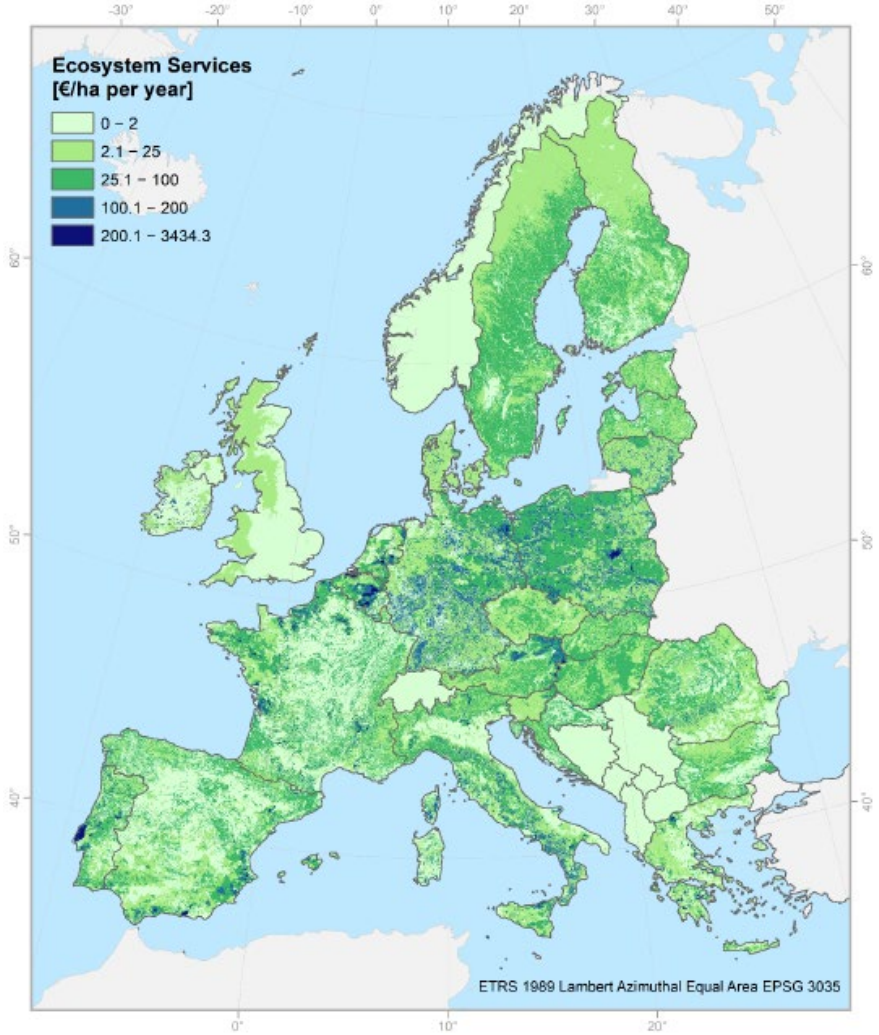


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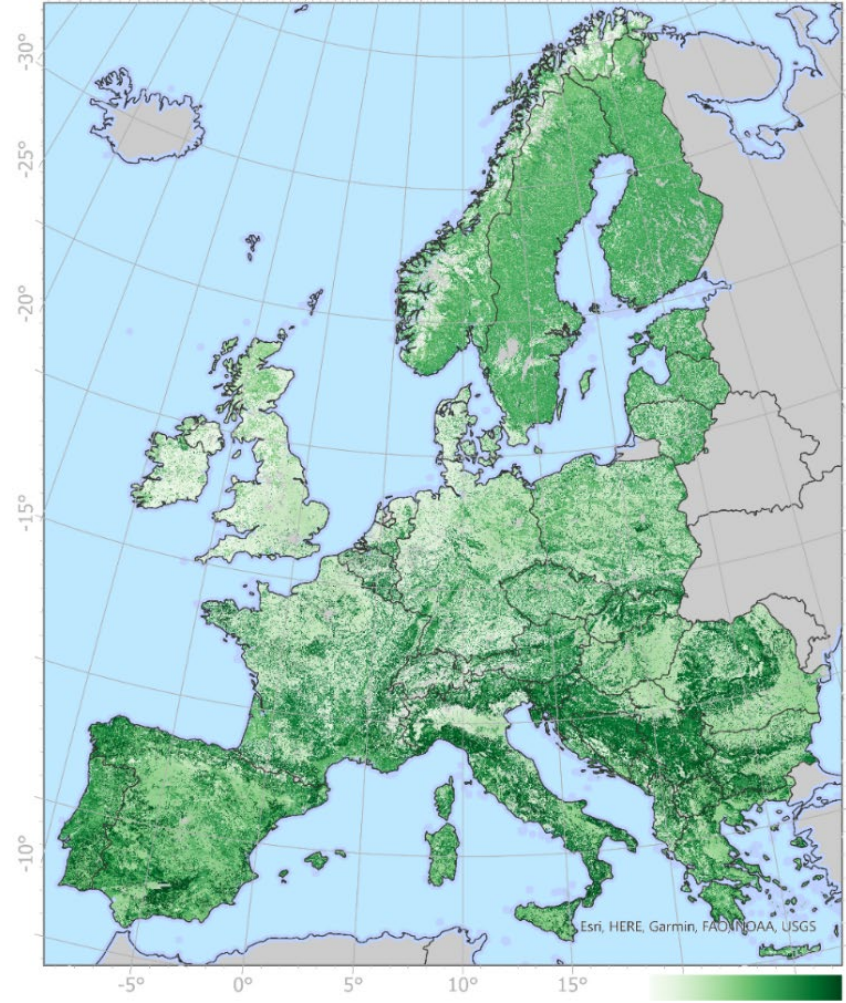
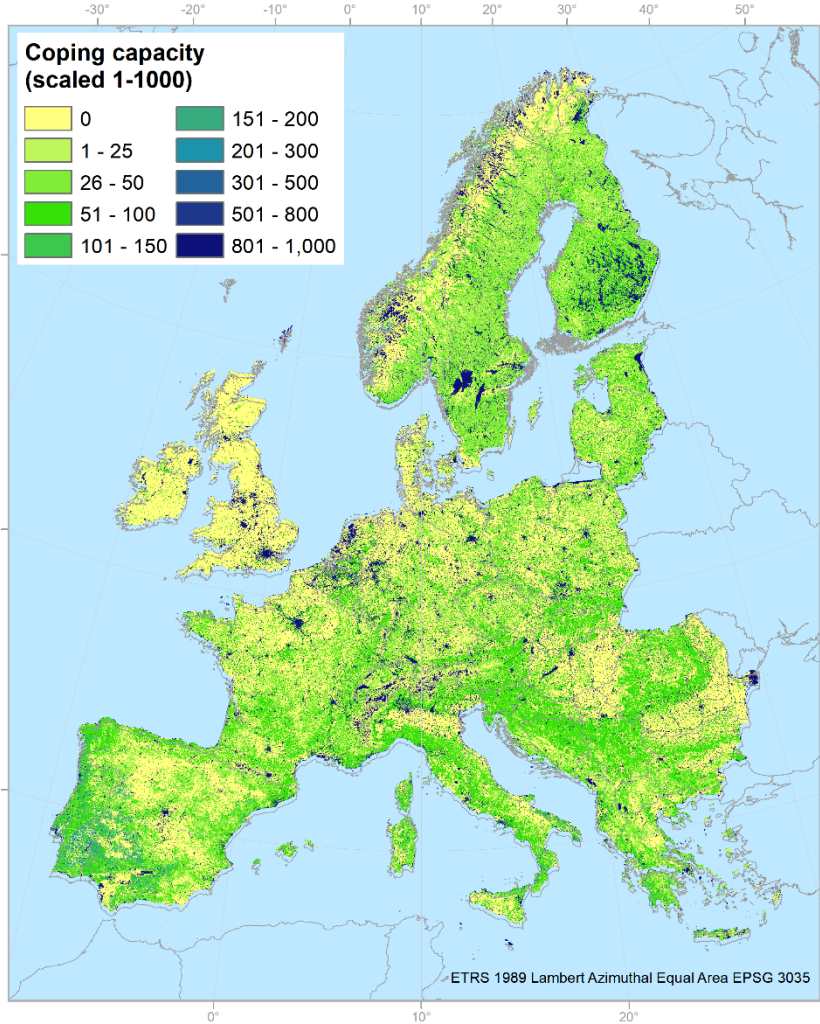
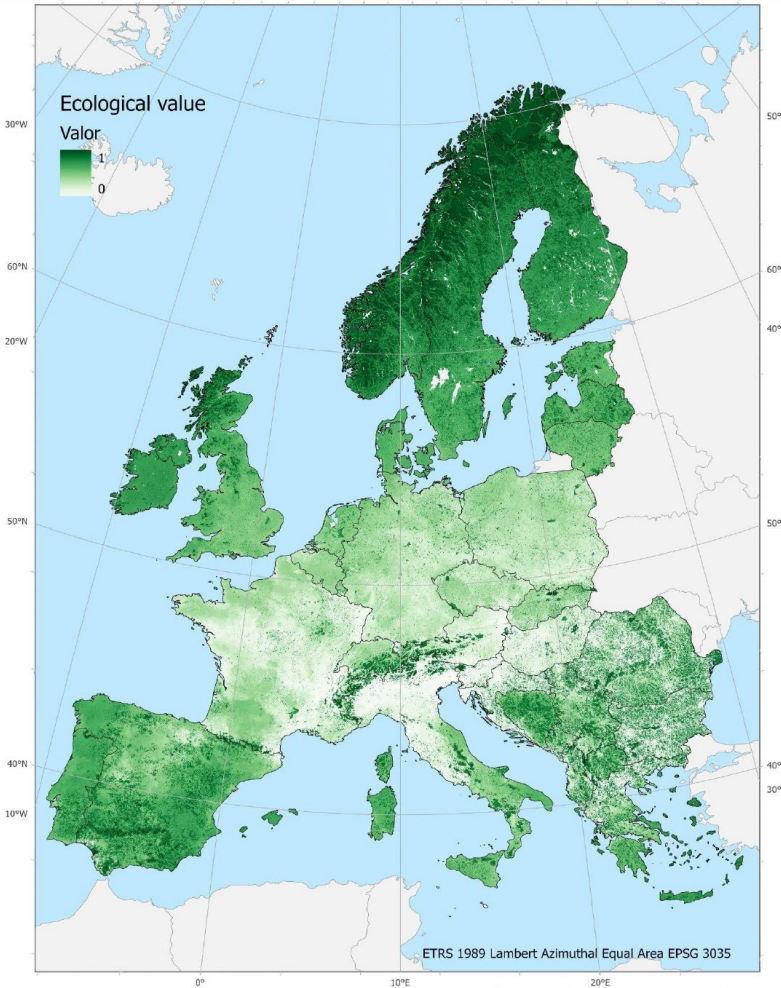
Vulnerability: Ecosystem services (Hutton, Scotland)

- Timber.
- Grazing.
- Mushrooms
- Recreational
- Soil erosion
- Carbon stocks



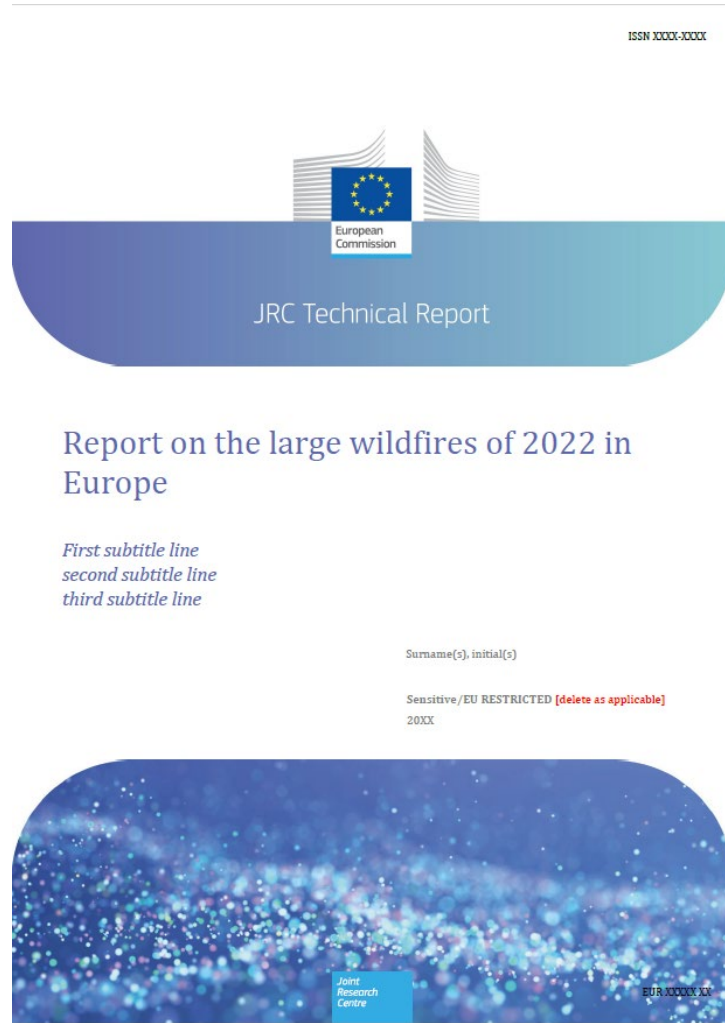
This project has been granted funding from the European Union’s Horizon 2020 research and innovation programme

Ecological vulnerability (IRD, France + U. Alcalá)



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Analyses of extreme fires (ADAI, SAFE, CNR)



FIREURISK - DEVELOPING A HOLISTIC, RISK-WISE STRATEGY FOR EUROPEAN WILDFIRE MANAGEMENT

Grant Agreement Number: 101003890	
Call identifier: H2020-LC-CLA-2018-2019-2020	
Topic:	LC-CLA-15-2020 Forest Fires risk reduction: towards an integrated fire management approach in the E.U.
Instrument:	RIA

Wildfires Investigation Protocol

Deliverable Identifier:	N/A
Deliverable Due Date:	N/A
Deliverable Submission Date:	N/A
Deliverable Version:	v.1
Lead partner:	ADAI
Authors:	Miguel Almeida (ADAI), Luís Mário Ribeiro (ADAI), Domingos Xavier Viegas (ADAI), David Caballero (MTG), Emilio Chuvieco (UAH), Patricia Oliva (UAH) and Mikhail Sofiev (FMI), Tiago Rodrigues (ADAI)

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- 3 ★ Aftermath survey – next days following the event / more than 1 week later....
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- 5 ★ Data mining, process and analysis
- 6 ★ Conclusions
- 7 ★ References

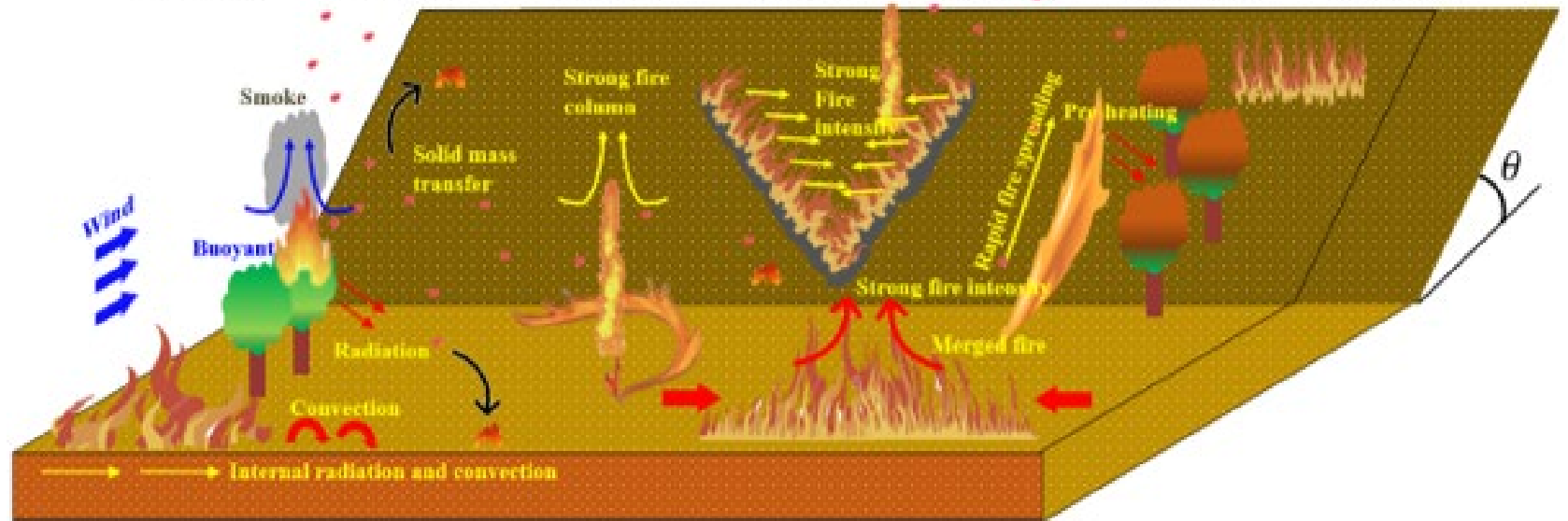


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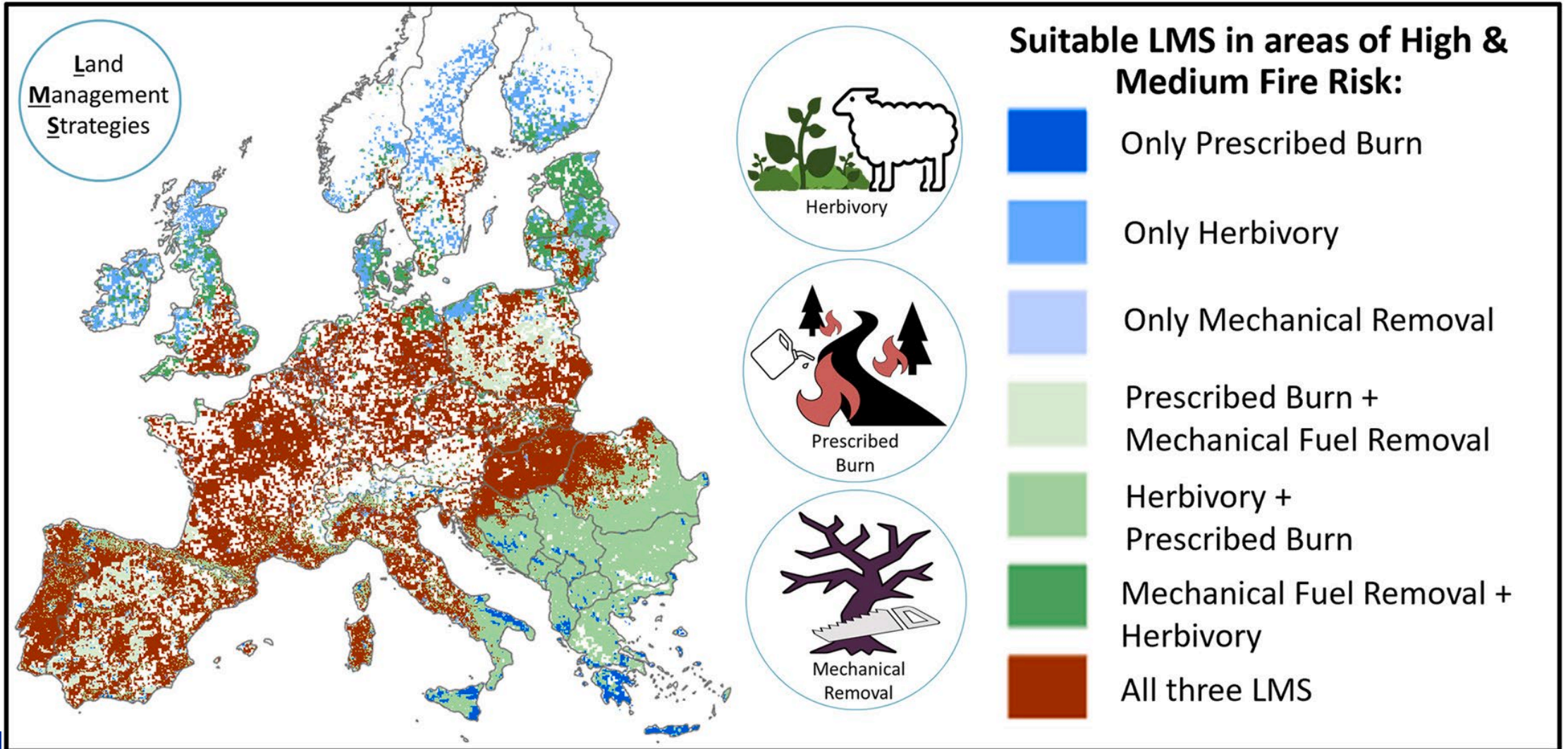


Extreme fire behaviours (ADAI, UNSW)

- Spot
- Crown
- Eruptive
- Junction
- Conflagrations
- Whirls
- Blow-up



Fuel Management Strategies (Vrije Universiteit Amsterdam)



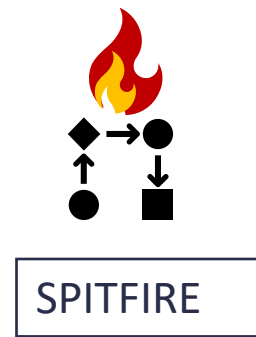
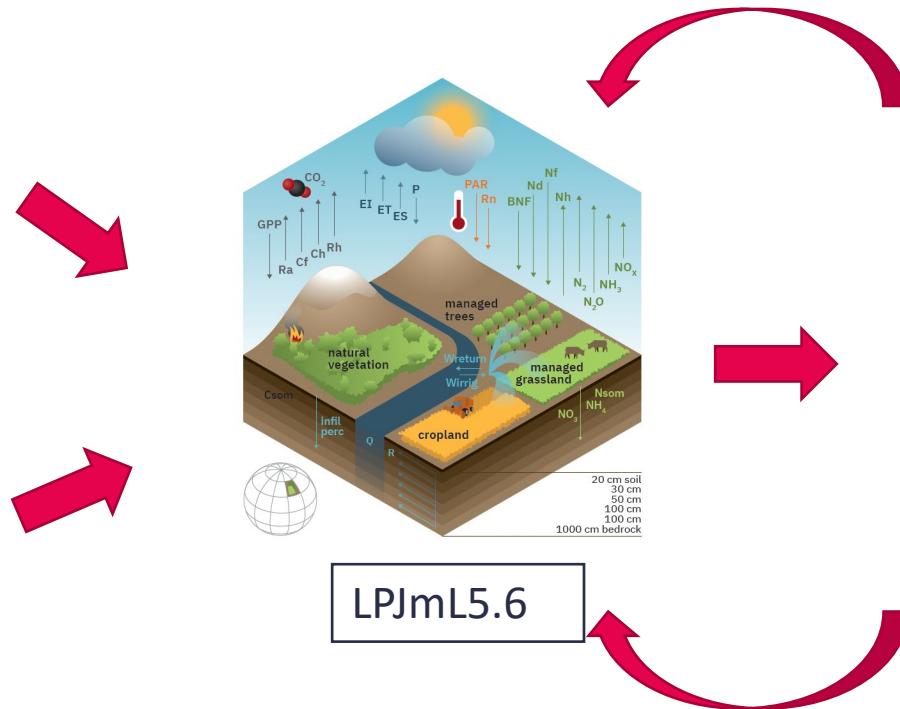
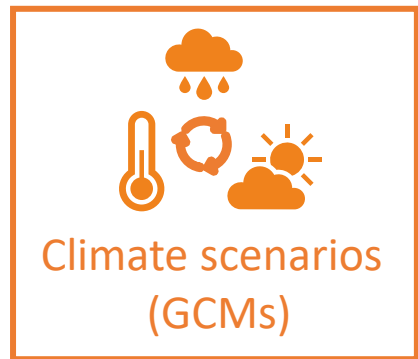
Towards future fire regimes

Data input

Vegetation model

Fire model

Future fire regimes



Future fire conditions: Climate scenarios (PIK, Germany; Meteogrid, Spain)

2nd round of data: projections at the European scale, daily/annual, 9 km

Variables

- CMIP6 climate (D3.1)
- Land-use projections (D3.2)
- Fire weather index projections (D3.4, manuscript in review)
- Vegetation projections (D3.4, manuscript in prep.)
- Burned area projections (D3.4, two manuscripts in prep.)



Scenarios

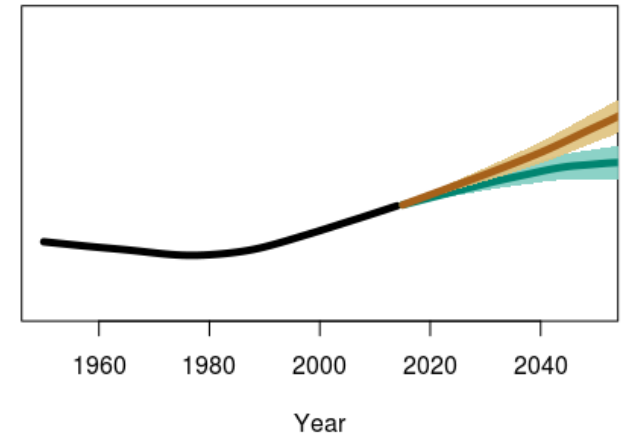
Local rivalry, SSP3-7.0, +4.0°-6.0°

- Upper limit (CanESM5)
- Medium projection (CNRM-ESM2-1)
- Lower limit (MPI-ESM1-2-HR)

The green way, SSP1-2.6, +1.5°-2.0°

- Upper limit (CNRM-ESM2-1)
- Medium projection (EC-EARTH3)
- Lower limit (MPI-ESM1-2-HR)

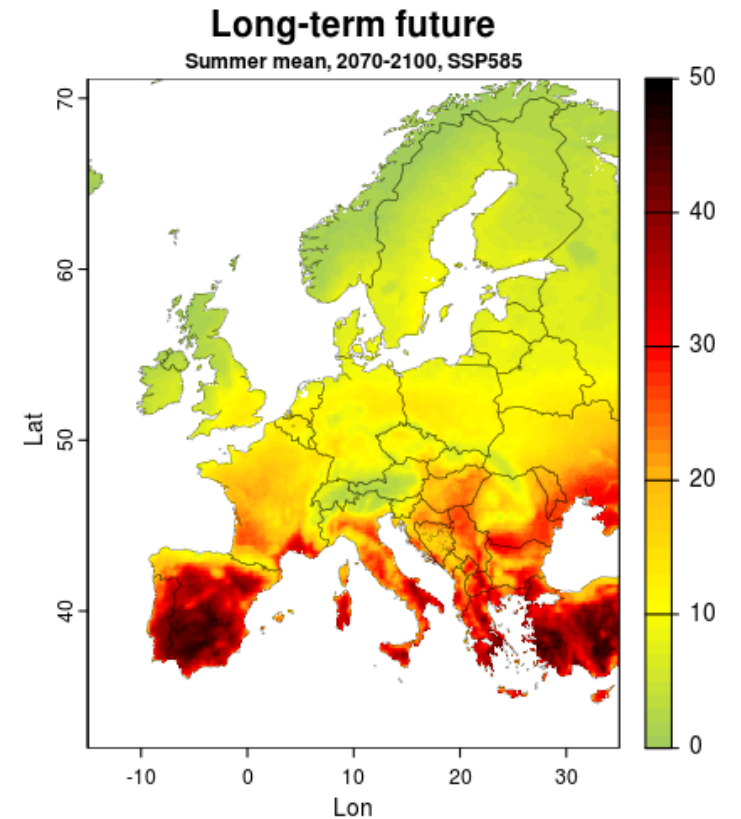
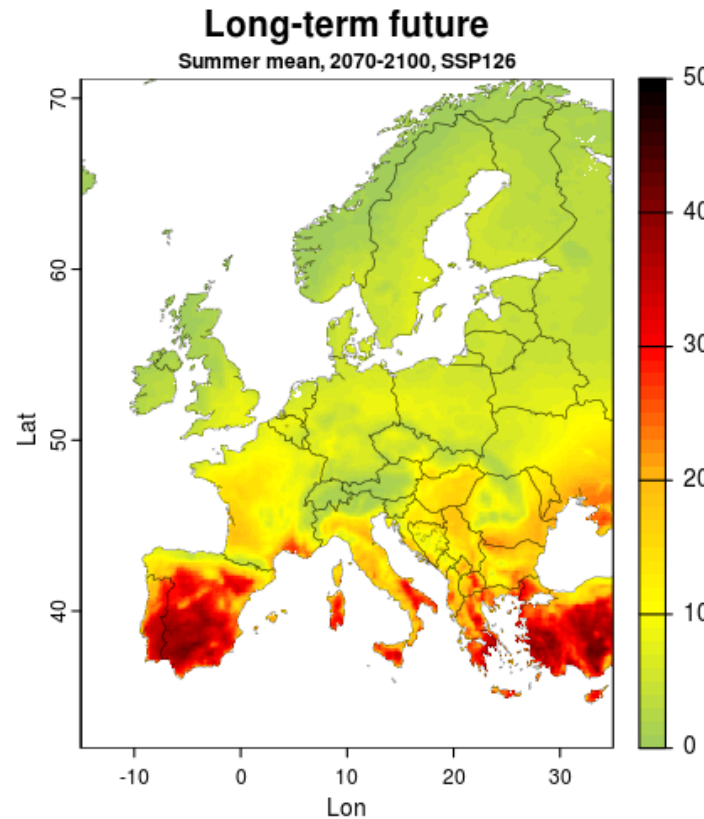
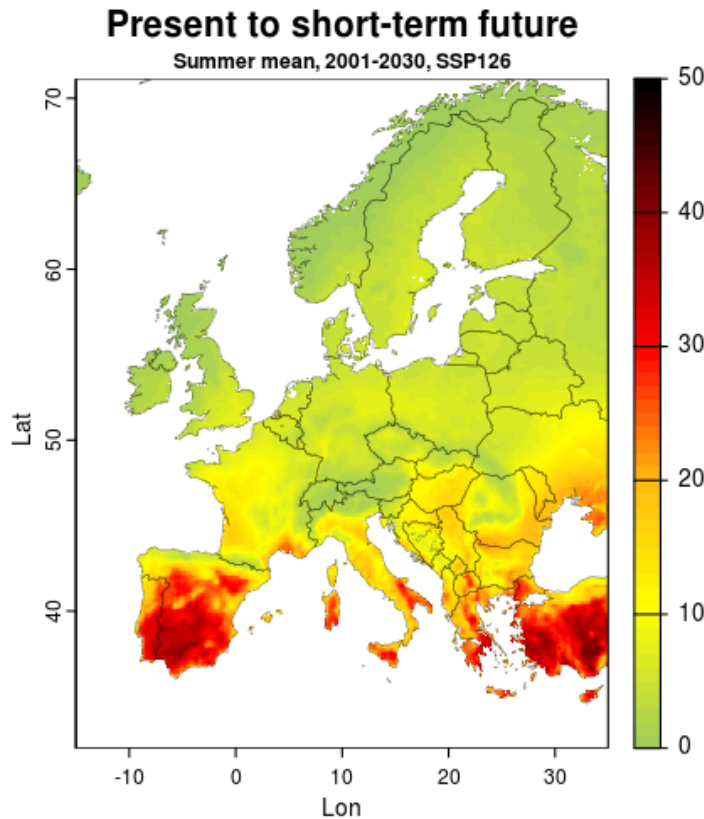
Fire weather index projections



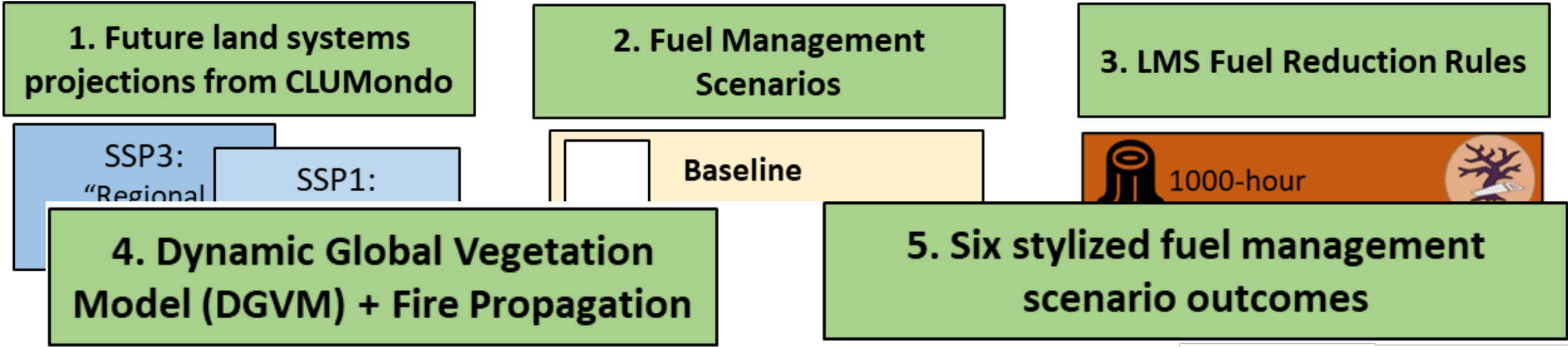
Future fire weather (Senckenberg, Germany)

We calculated the Canadian Fire Weather Index (FWI) using future climate scenarios

Danger classes	
$\text{FWI} < 5.2$	very low
$5.2 \leq \text{FWI} < 11.2$	low
$11.2 \leq \text{FWI} < 21.3$	moderate
$21.3 \leq \text{FWI} < 38$	high
$38.0 \leq \text{FWI} < 50$	very high
$50 \leq \text{FWI}$	extreme



Future fire conditions (PIK (Germ), Meteogrid (Spain))

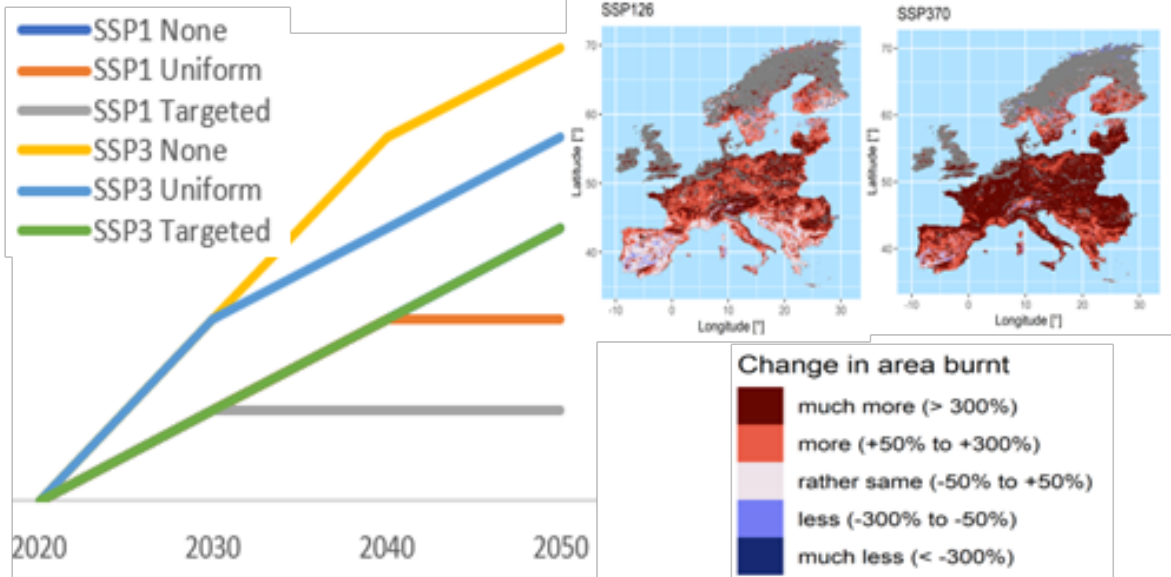


4. Dynamic Global Vegetation Model (DGVM) + Fire Propagation

5. Six stylized fuel management scenario outcomes



LPJML-SPITFIRE





Improving wildfire management

A unique approach that integrates society, economy and policies into risk administration



Assessment



Reduction



Adaptation

emilio.chuvieco@uah.es

