



Climate change, forest fires and green house emissions

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Outline:

1. Wildfires: a global issue
2. Wildfires in Europe
 - Spatial and temporal trends
 - Links between Fire Danger and Burned Areas
3. Wildfire damages
 - Green House Gas emissions
 - Natura 2000 areas
 - Economic and human losses
4. Wildfires in future climate scenarios
5. Summary and conclusions

Wildfires: a global issue

- Humans have co-existed with wildfire since ancient times
- Wildfires are intrinsic to ecosystem dynamics and a tool in agricultural practices

However:

- Fires burn approximately 400 Million ha of land every year
- Fires emissions contribute, globally, to about 20% of greenhouse gas emissions
- The natural dynamics of wildfires has been changed by fire exclusion policies
- Wildfires are the cause of environmental degradation, leading to desertification in some regions of the world
- Wildfires are the cause of increasing losses of human lives and economic damages

All the above were unprecedented events!

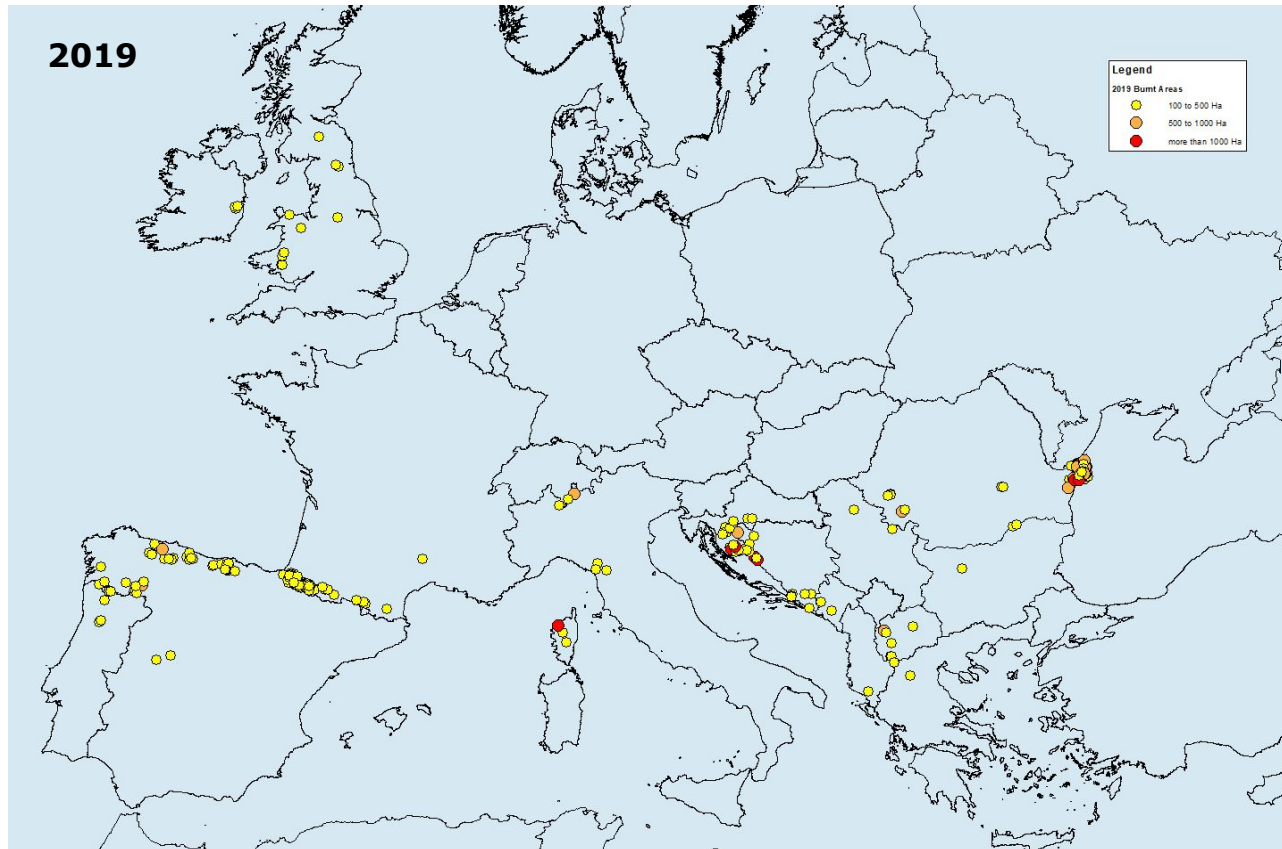
The intensity and impact of critical wildfires is increasing in Europe, and globally.

Climate change is identified as the cause of unprecedented critical fires: some recent examples Alaska & Indonesia (2015), Canada, California, Portugal (2016), Chile, Canada, Australia, South Africa, California, Europe (2017), California & Europe (2018)



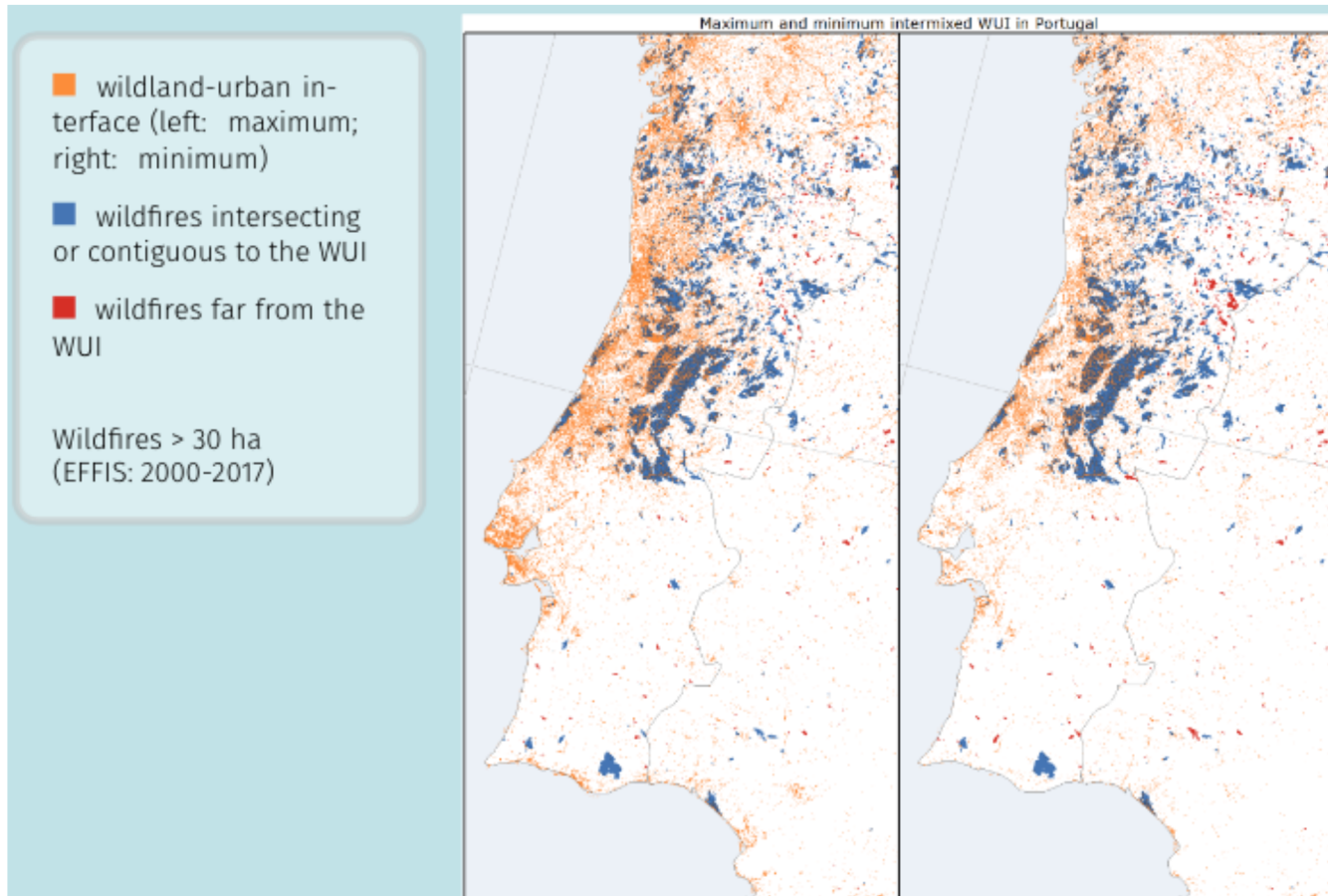
What is the situation in Europe?

Spatial distribution of large fires in Europe



Spatial distribution of large fires in Europe

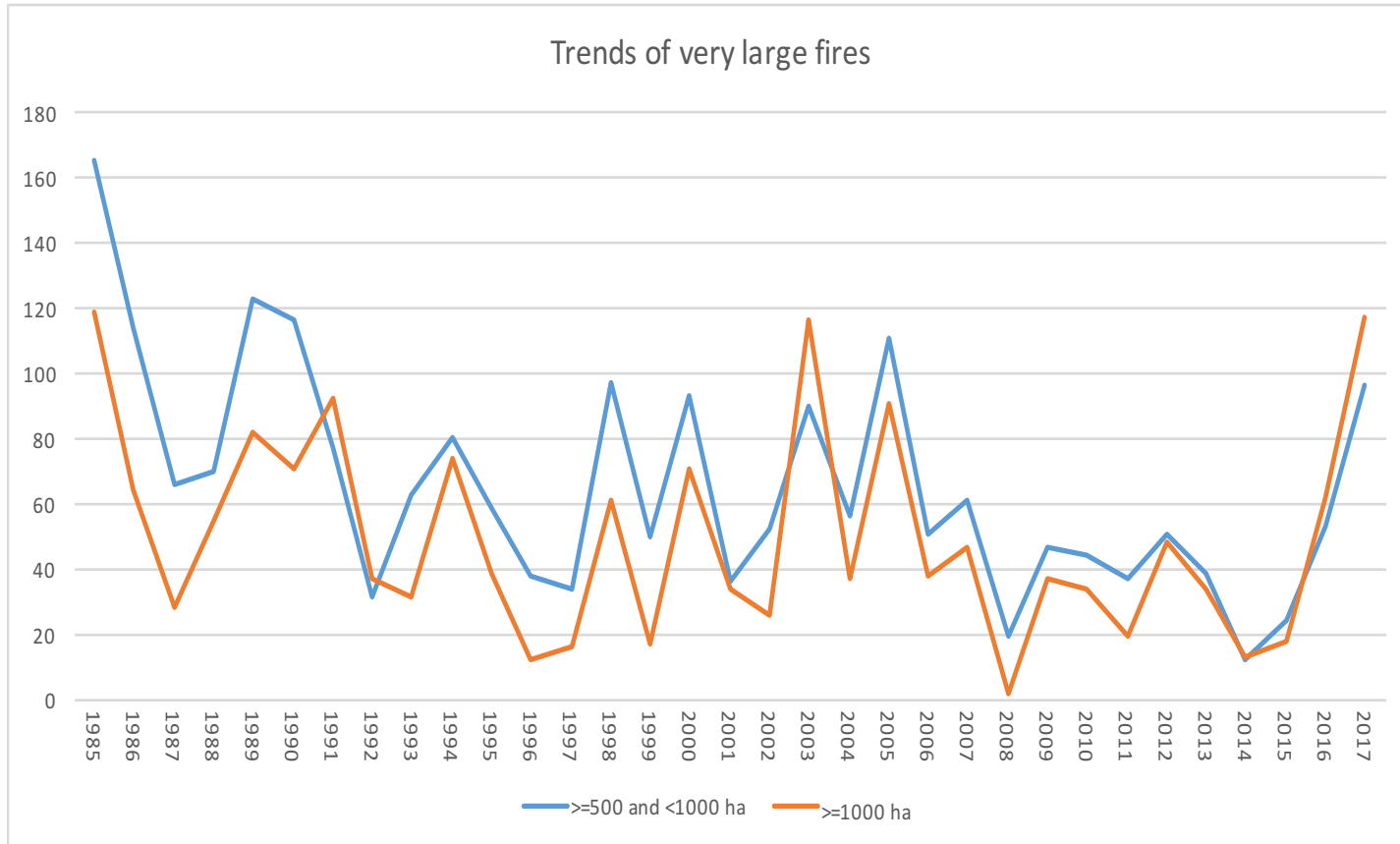
Most fires take place in the Wildland-Urban Interface (WUI)



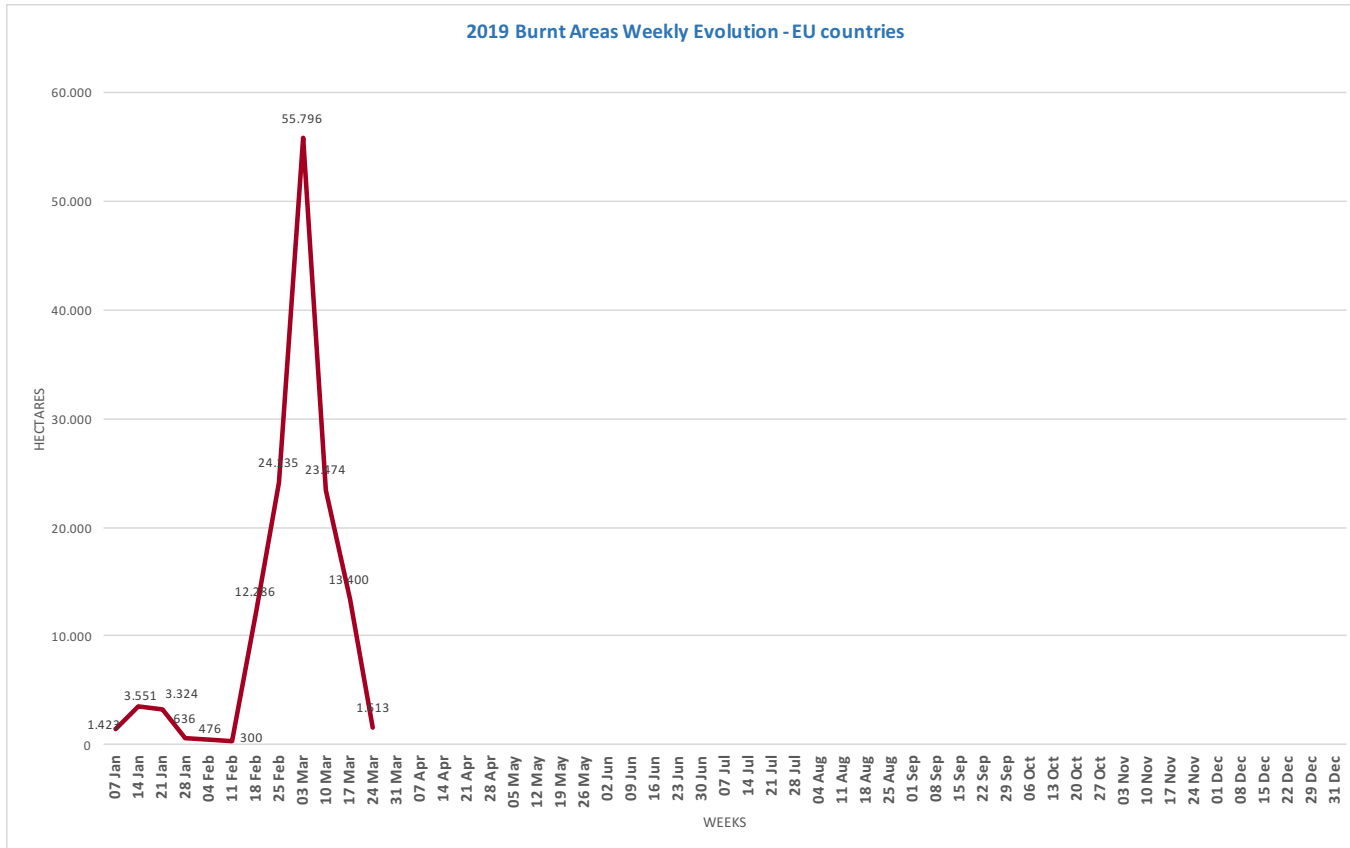
Source: Costa, H., de Rigo, D., Libertà, G., Houston Durrant, T., San-Miguel-Ayanz, J., 2019.
European wildfire danger and vulnerability in a changing climate: towards integrating risk dimensions.
Publication Office of the European Union, Luxembourg, (in preparation)

Wildfires are becoming frequent in areas where they use to be rare events
Most fires are ignited and burn in the Wildland Urban Interface

Trends in the number of fires (by size) in Europe



Seasonal distribution of burnt areas 2017/2018/2019



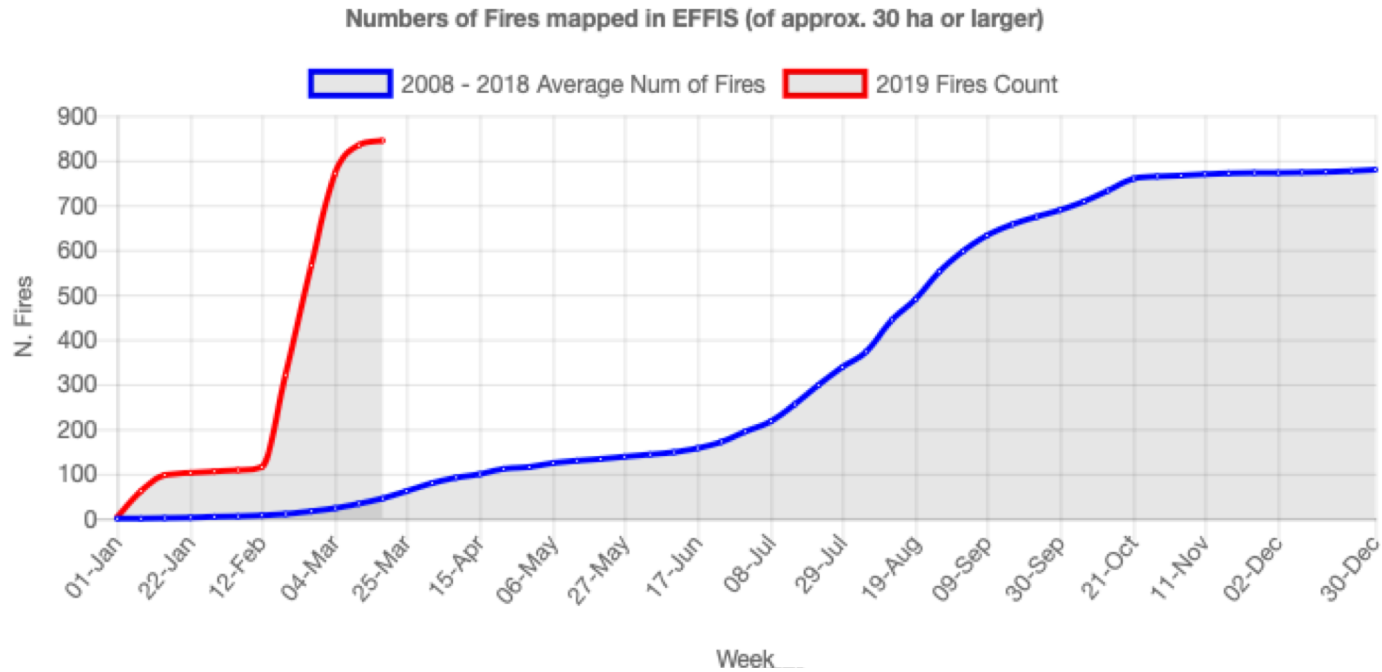
* JRC preliminary EFFIS report for the 2017 wildfire

Trends of burnt areas and number of fires - 2019

Burnt Areas

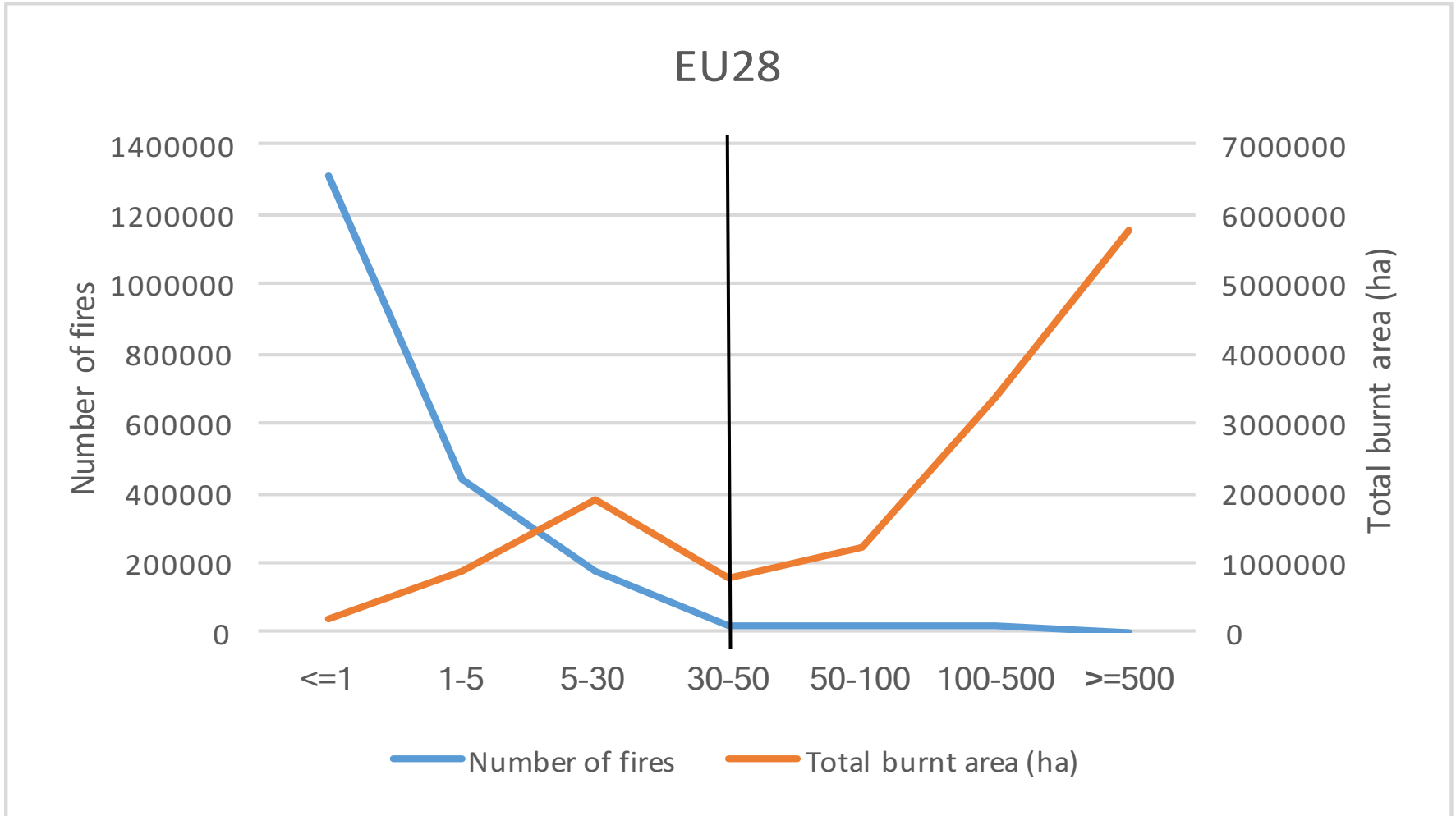
Number of Fires

SEASONAL TREND - Total EU

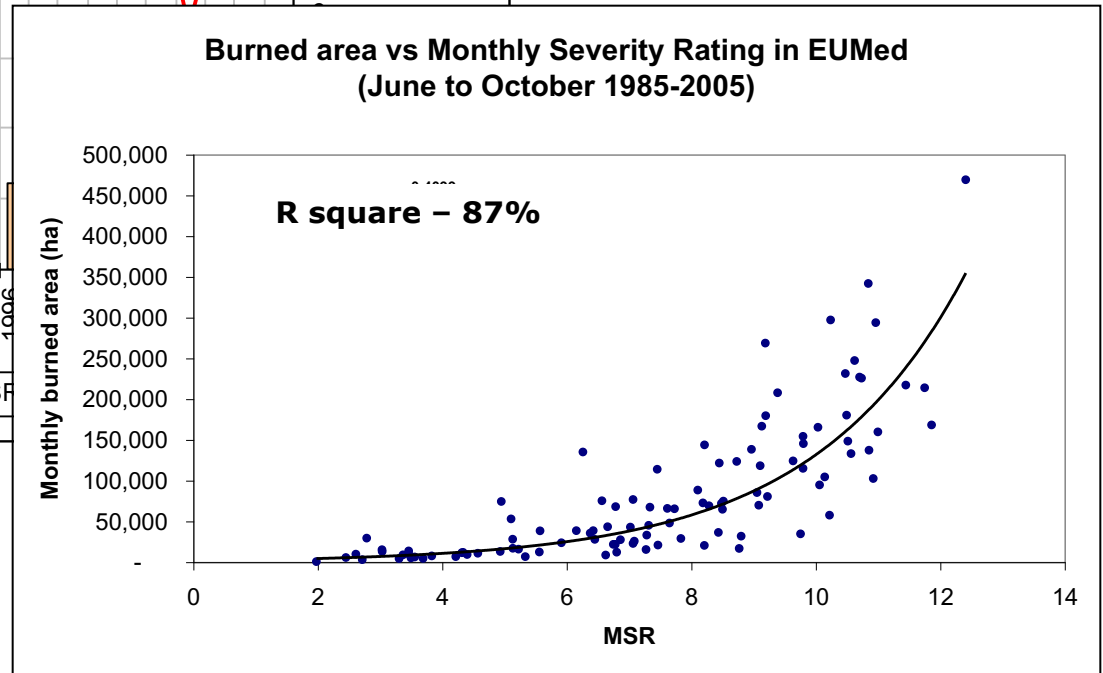
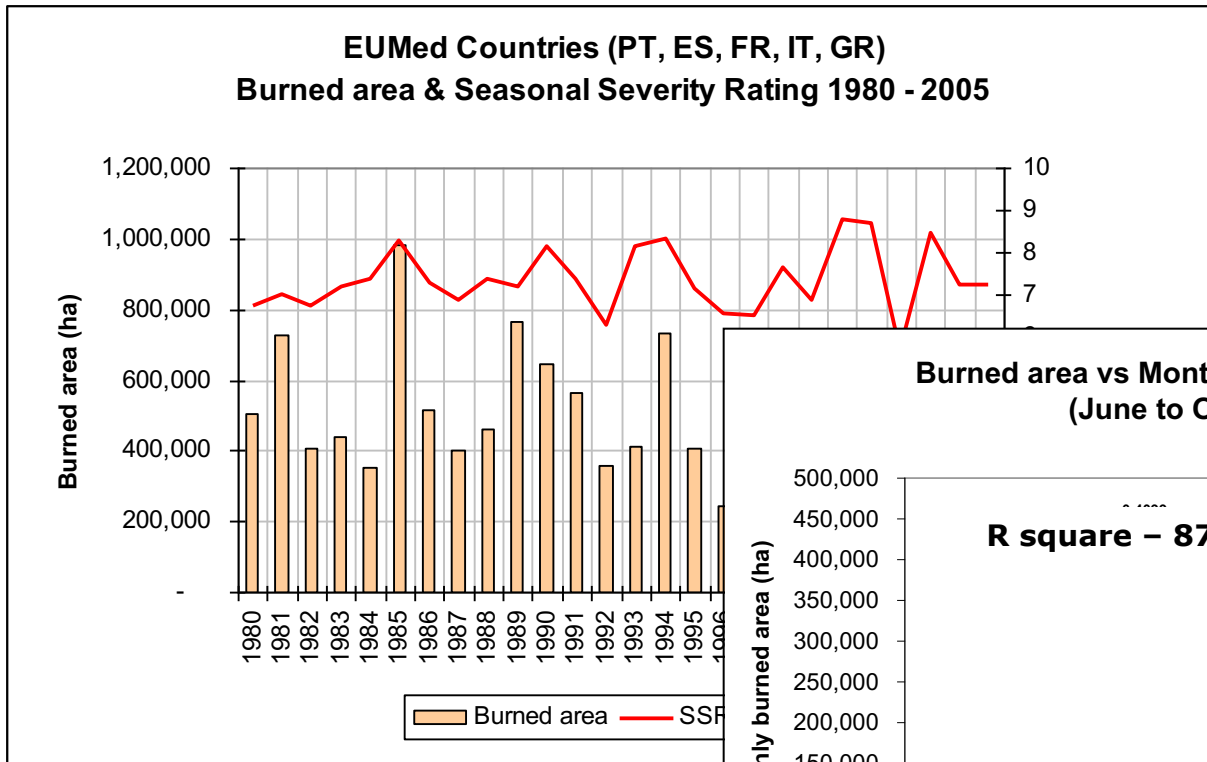


Wildfires regimes are changing, with critical fires outside the traditional fire season

About 2-3% of the wildfires burn approximately 85% of the total area burned



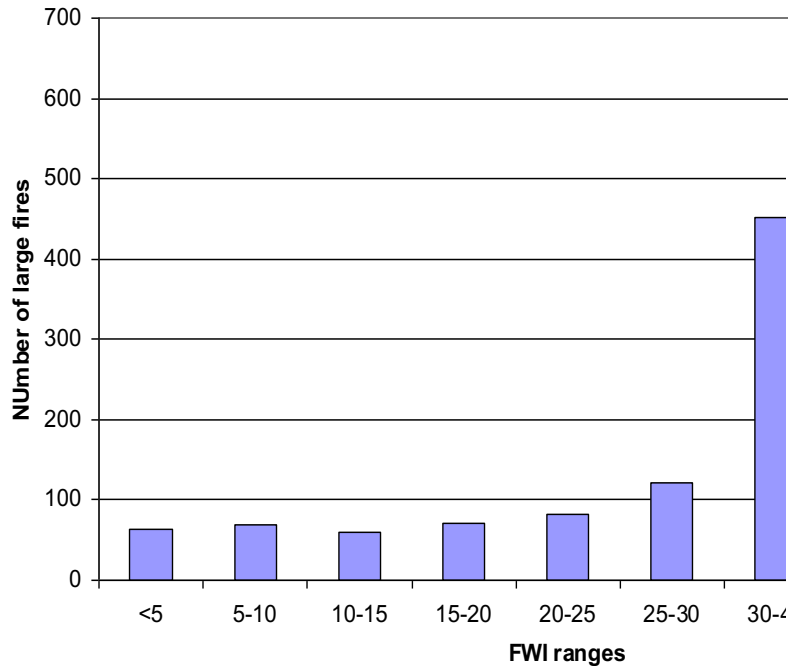
Burnt areas vs fire danger (seasonal severity rating)



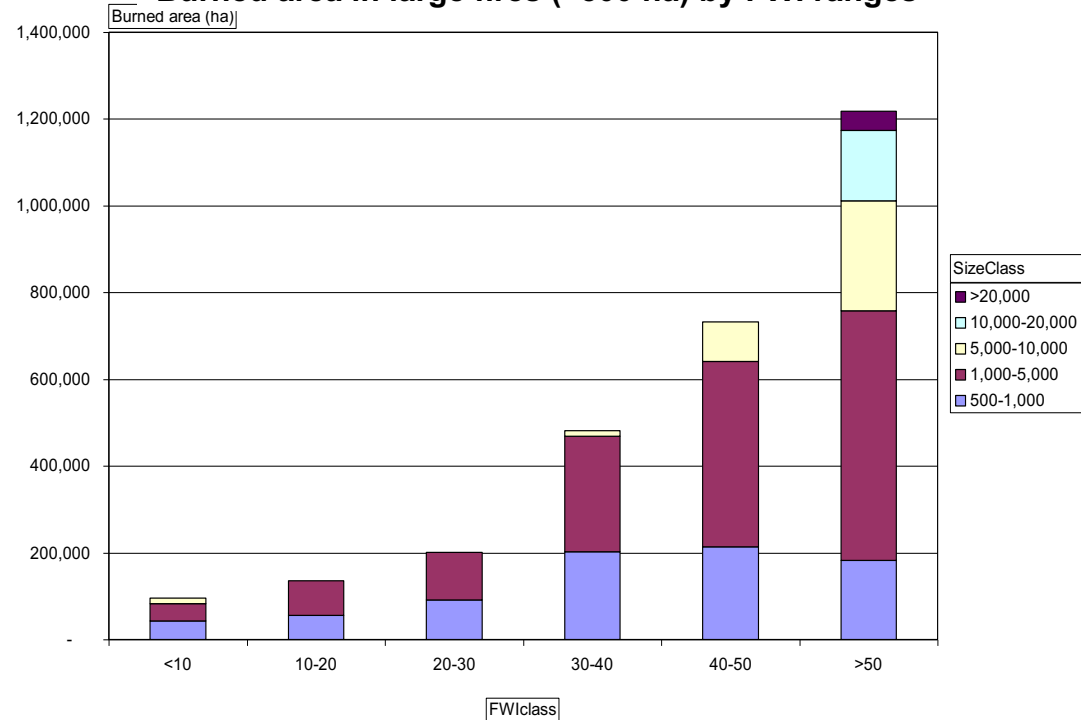
Amatulli et al. 2013

Size of burnt areas vs fire danger (seasonal severity rating)

Number of large fires (>500 ha) and FWI values

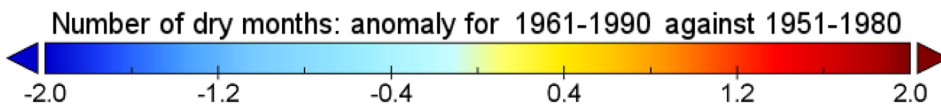
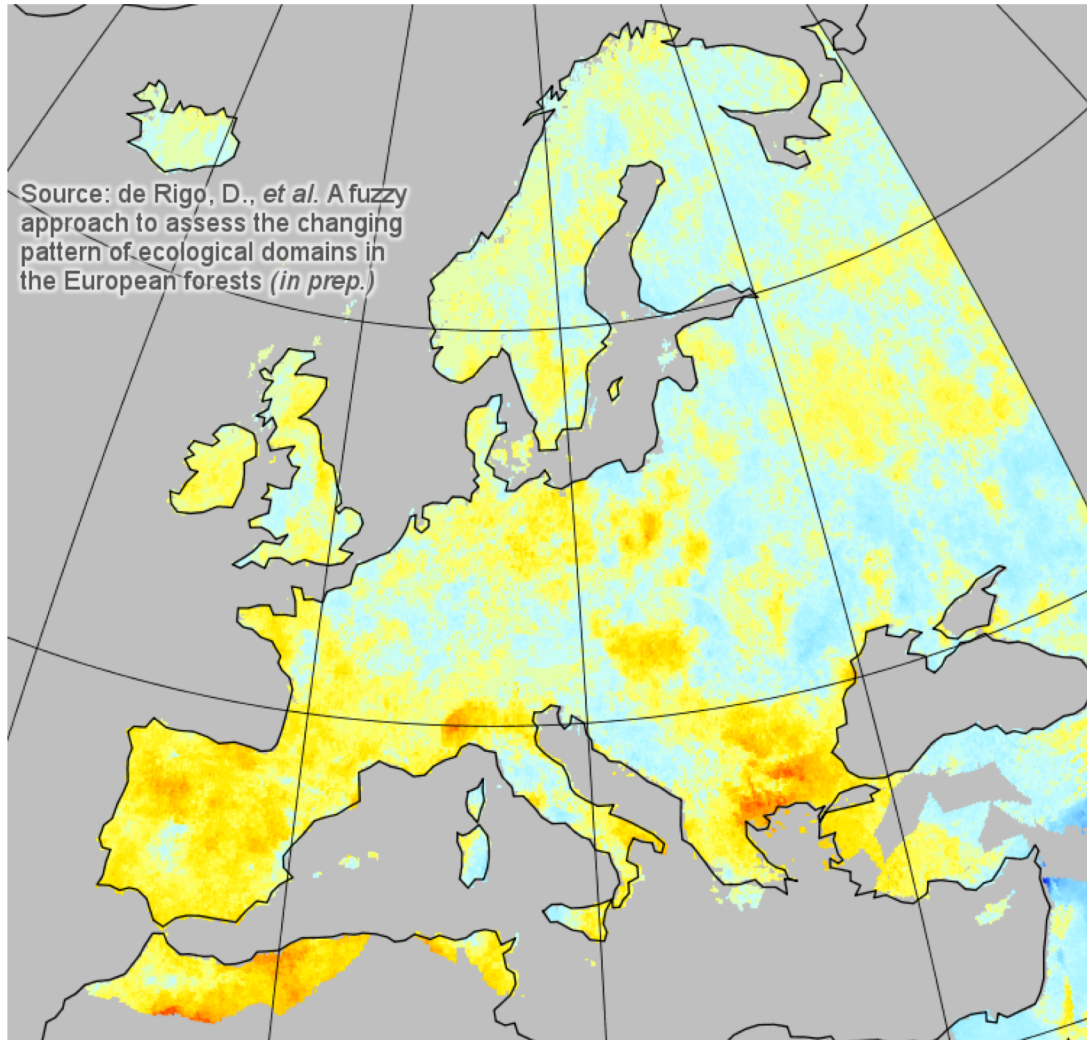


Burned area in large fires (>500 ha) by FWI ranges



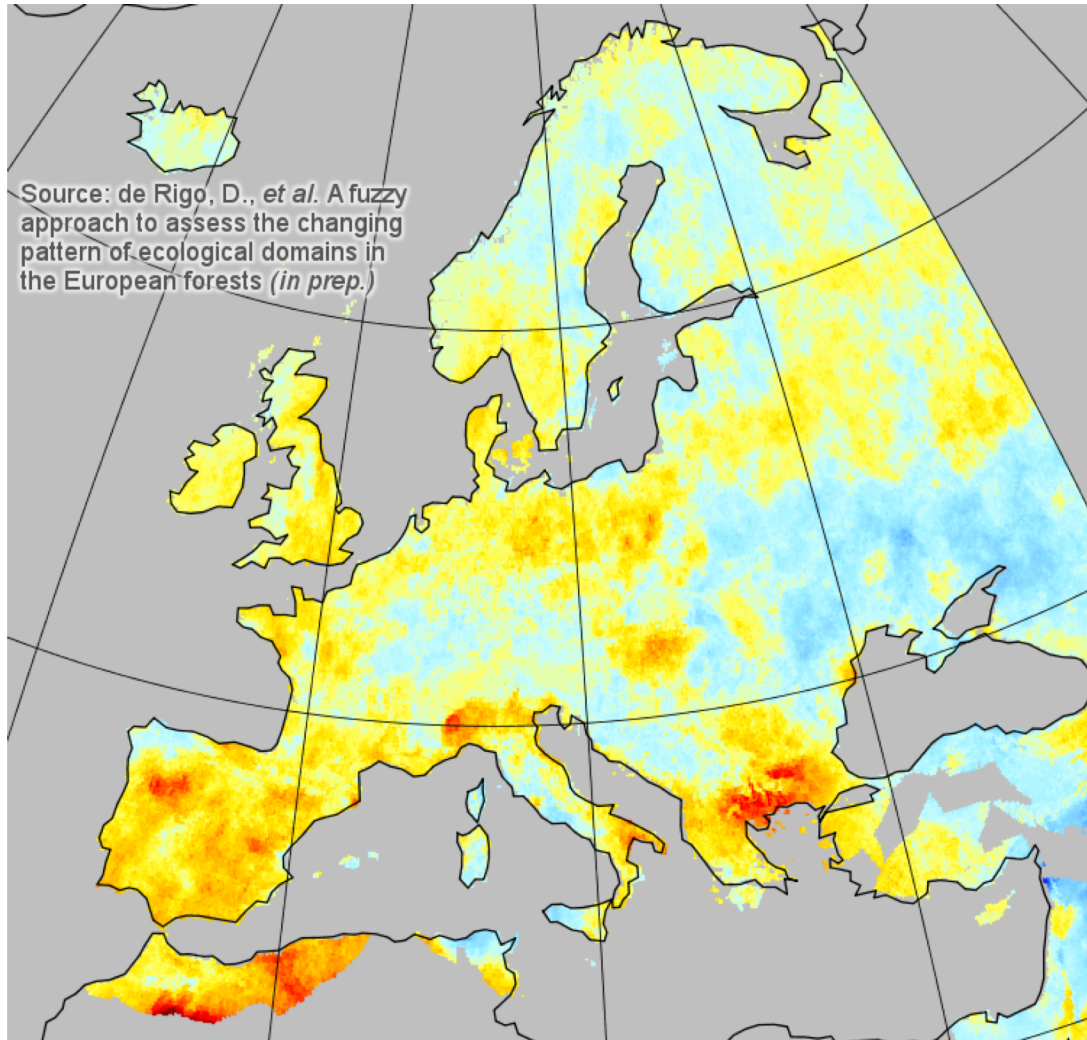


Current Climate – Anomalies in the number of Dry Months per year

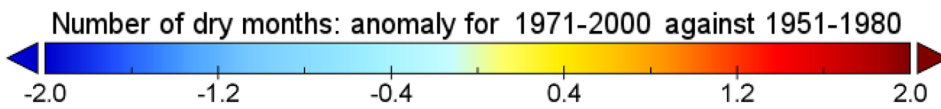




Current Climate – Anomalies in the number of Dry Months per year

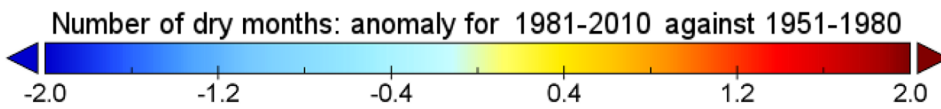
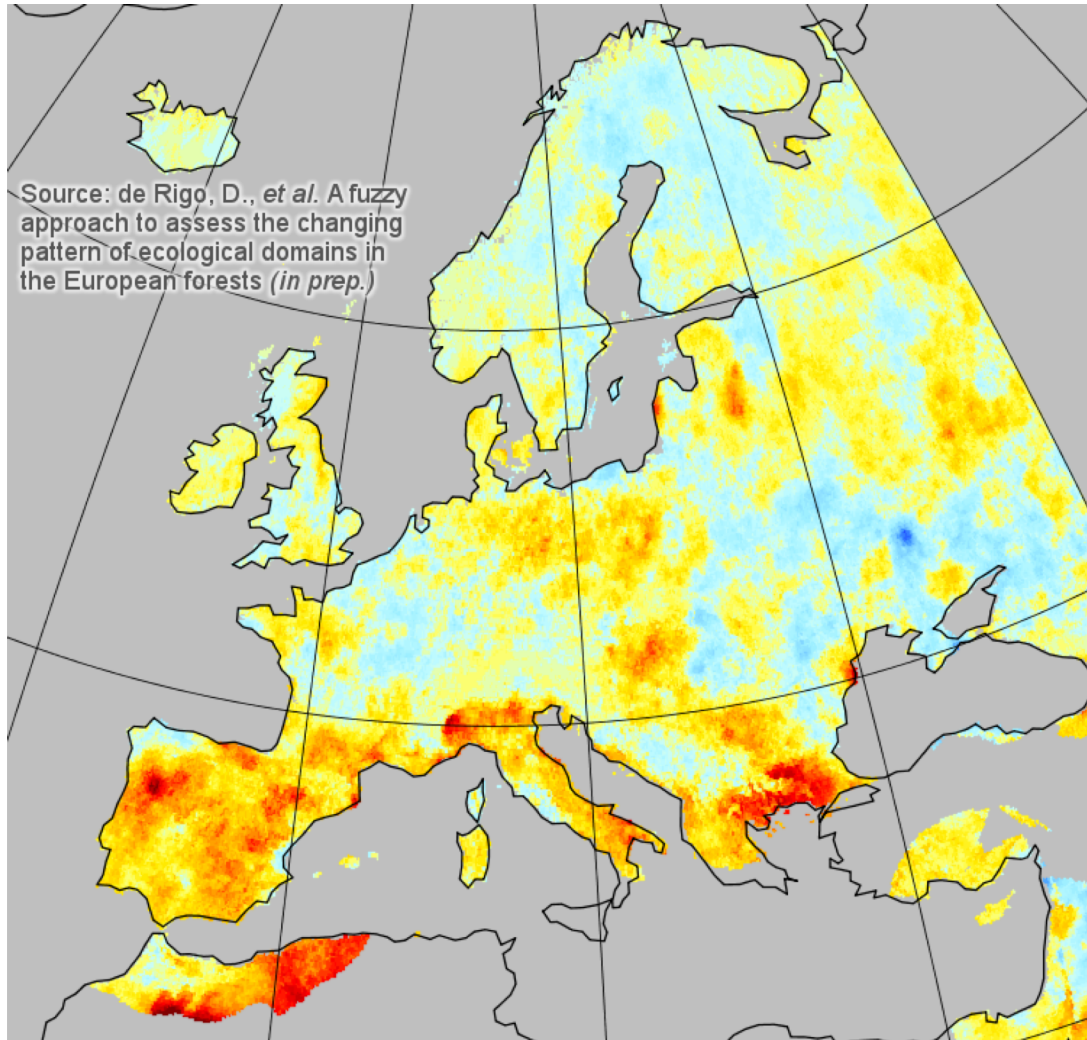


Source: de Rigo, D., *et al.* A fuzzy approach to assess the changing pattern of ecological domains in the European forests (*in prep.*)



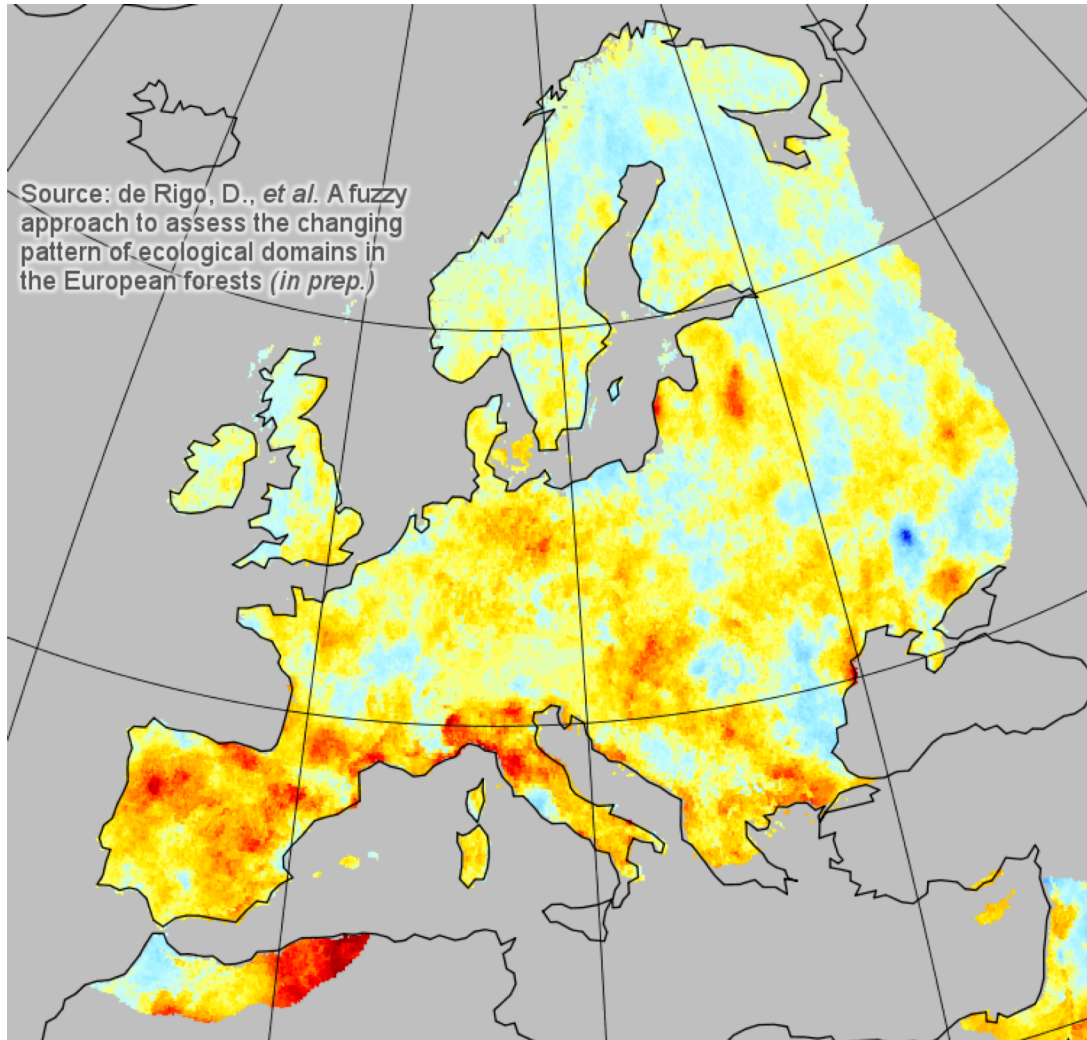


Current Climate – Anomalies in the number of Dry Months per year





Current Climate – Anomalies in the number of Dry Months per year



Number of dry months: anomaly for 1989-2018 against 1951-1980

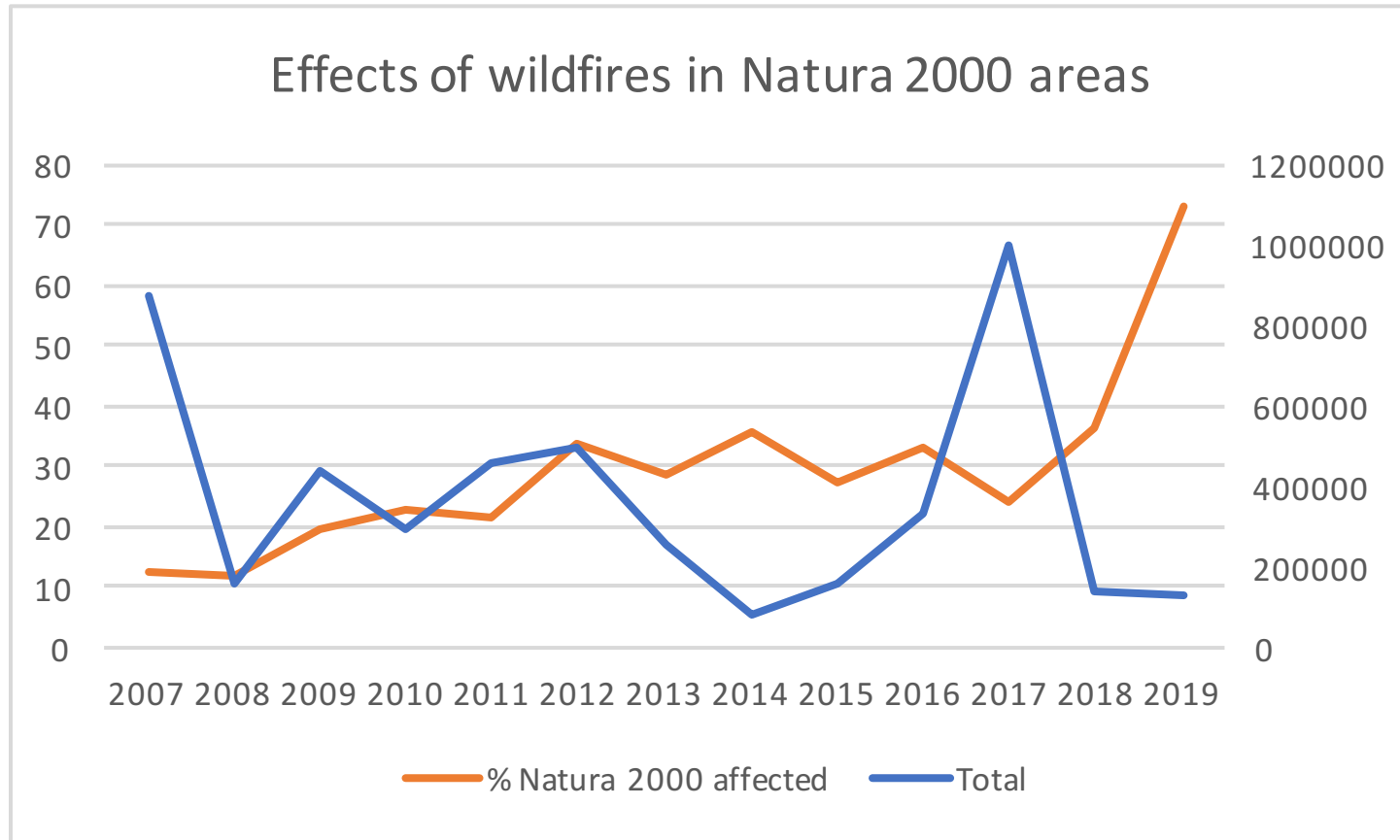


Fire Danger is highly correlated with weather conditions

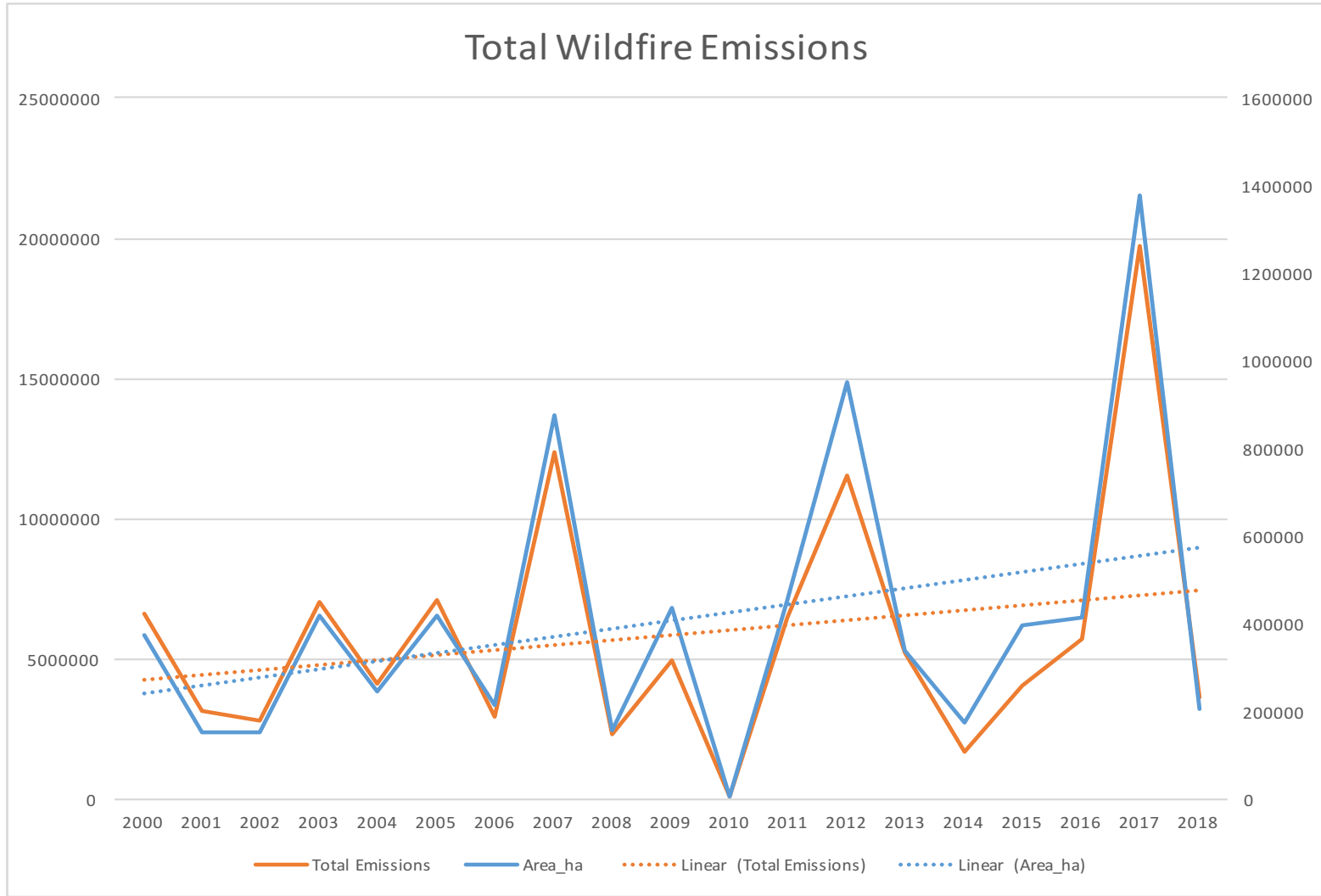
Total burned area is highly dependent on Fire Danger -> explained by weather

Climate is already changing, leading to higher fire danger conditions

Very large fires, which only occur under critical fire danger conditions, are becoming frequent events



Wildfires seriously affect natural protected areas in the EU



Wildfire emissions are, overall, increasing, with peaks of emission affecting local populations

Impact of wildfires in the EU in the period 2000-2018

- Area burnt: **8.7 Million ha** (about the size of Austria), approx. 460000 ha/year
- Firefighters and civilians killed by wildfires: **715 people**, equiv. to nearly 38 people killed every year
- Economic losses: over **57 Billion Euro**, approx. 3000 Million per year

Estimation of economic losses from wildfires in the EU: Report by the European Forest Fire Information System (in press).

Fire Danger Projections under Climate Change scenarios

Present

2 °C global warming

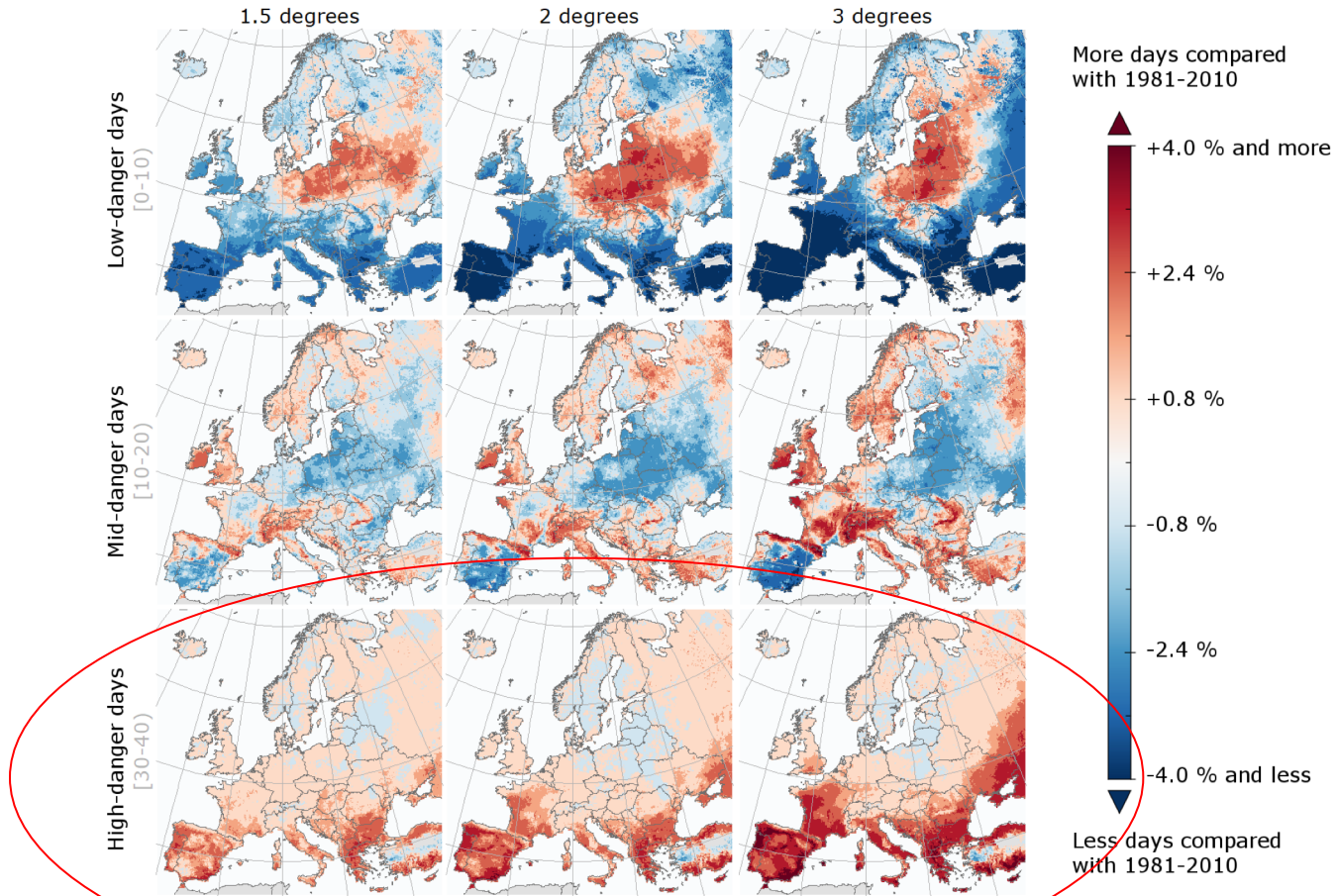
High emission (2070-2100)

(Drought Code)
Ensemble of models



JRC Peseta II and III reports, (2017, 2018)

Fire Danger Projections – number of days with high fire danger



Source: Costa, H., de Rigo, D., Libertà, G., Houston Durrant, T., San-Miguel-Ayanz, J., 2019. European wildfire danger and vulnerability in a changing climate: towards integrating risk dimensions. Publication Office of the European Union, Luxembourg, (in preparation)

Wildfire danger is expected to increase in the future, according to climate change scenarios

With increased fire danger, it is expected that frequency and intensity of wildfires will increase

Under future climate scenarios, annual losses from wildfires may increase to over 5 Billion Euro per year

Summary and conclusions

- Wildfires are a recurrent phenomenon in Europe, resulting in the loss of human lives and large environmental and economic damages.
- Spatially, wildfires are becoming frequent in areas where they use to be rare events
- The area at risk of wildfires is continuously expanding as a result of land abandonment and the increase of the wildland-urban interface in Europe
- The lengths of the fire seasons are increasing, with abnormal distribution of wildfire numbers and burned areas in comparison with previous fire regimes
- Intensity and frequency of critical events is increasing, globally, and in Europe, beyond those of past records
- Emissions from wildfires have increased in the last decades, and are to become an issue in areas where fires take place
- Climate change is already noticeable, leading to an increase in the level of wildfire risk and the expansion of the areas at risk in Europe.



**Taken into consideration the above conclusion and
the fact that most wildfires in Europe are human-caused and climate driven**

The focus should be on:

- Raising the awareness and education of the population,
- Sharing knowledge & lessons learned,
- Enhancing adaptation, fire prevention & planning and
- Increasing preparedness for fire fighting

Thank you

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<http://effis.jrc.ec.europa.eu>