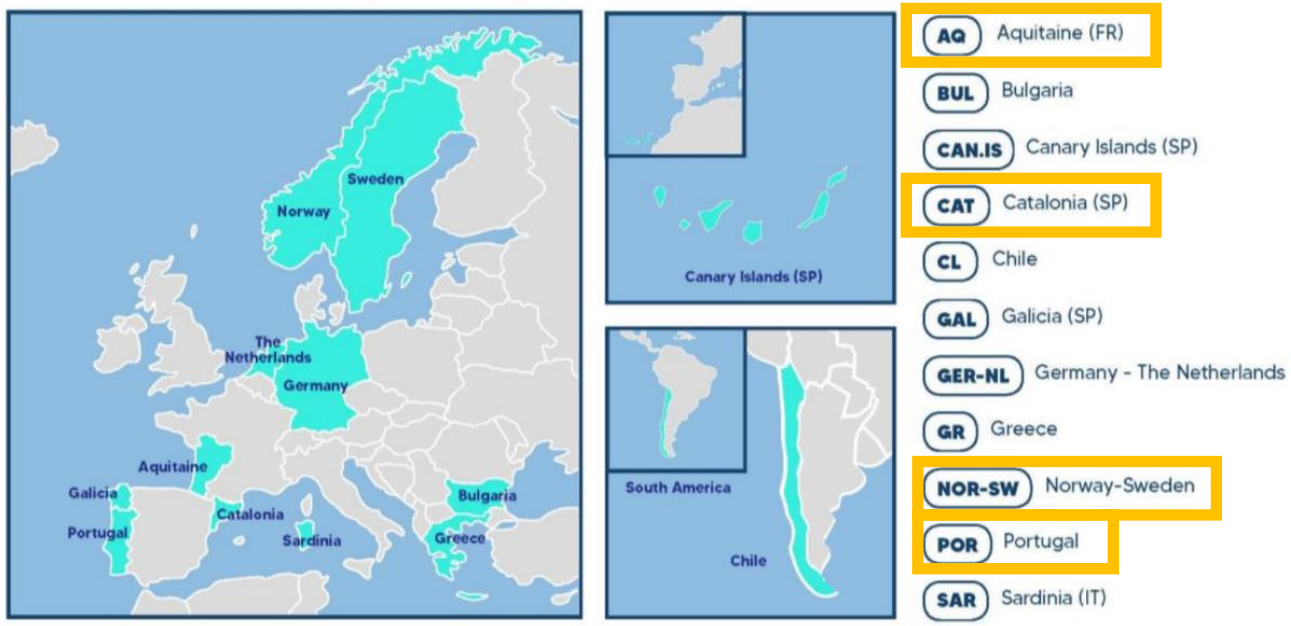
WP2 / IA 2.1

Improving data acquisition for landscape design based on novel remote sensing methods

- **Subtask 2.1.1: A dynamic high-resolution map of the state of the forest and fuel**
- **Subtask 2.1.2: Innovative methodologies for fuel structure assessment**



FIRE-RES

Innovative technologies & socio-ecological-economic solutions for fire resilient territories in Europe

D2.1 Improving data acquisition for landscape design based on novel remote sensing methods

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Project Acronym: FIRE-RES

Project name: Innovative technologies and socio-ecological-economic solutions for fire resilient territories in Europe

Call ID: H2020-LC-GD-1-1-2020 (Preventing and fighting extreme wildfires with the integration and demonstration of innovative means)

Work Package: 2

Task Number: 2.1

Lead beneficiary: ICGC

Contributing beneficiaries: ICGC, INRAE, NIBIO

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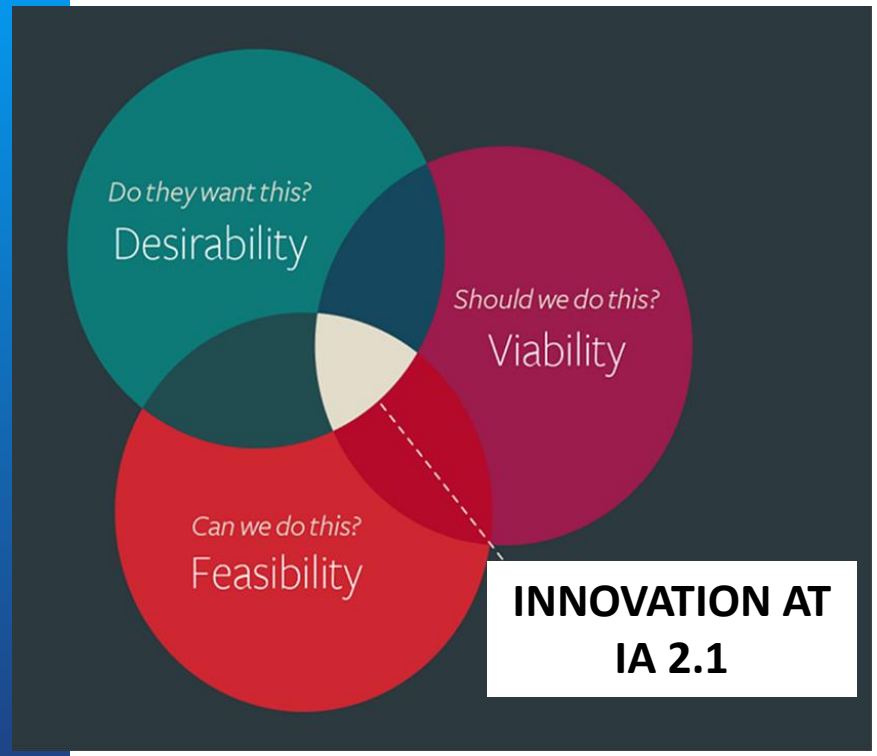
Improving data acquisition for landscape design based on novel remote sensing methods



Challenges to be suit at I.A. 2.1

- **Slow end user uptakes of remote sensing solutions**

At FIRE-RES this challenge has been solved throughout close communication between scientist and end users, including stakeholders, regulators or firefighters among others based on a set of workshops and participate events

- **Gap between the potential of remote sensing and its real implementation**

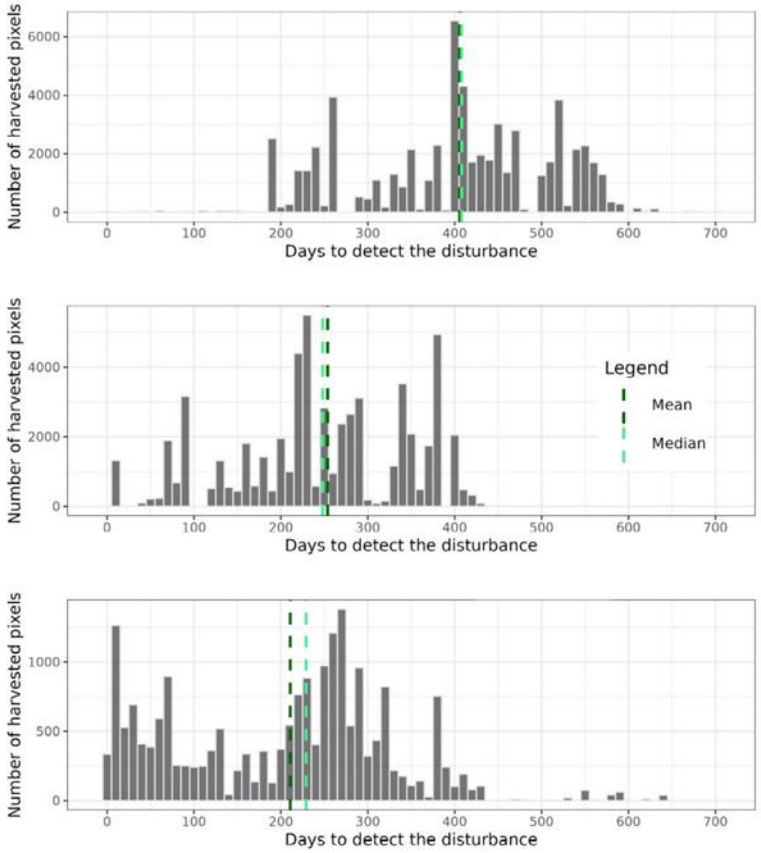
At FIRE-RES has been defined a set of Living Labs with different climates, species and challenges related to the management of the forest land.

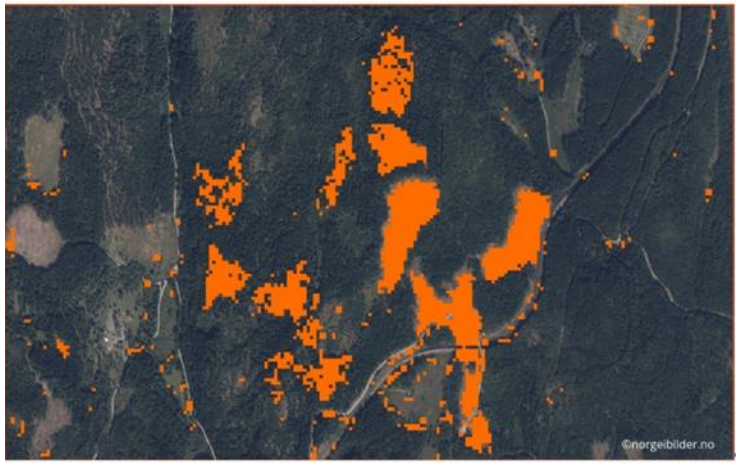
- **Integrity and quality of products, services based on remote sensing data**

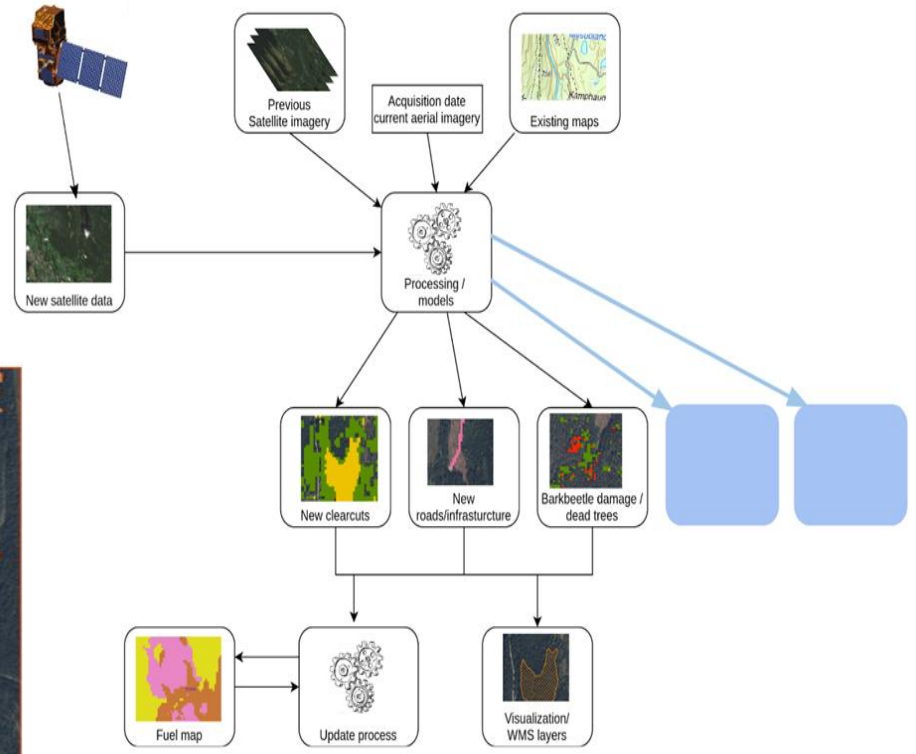
As much as possible, remote sensing assets have been based on open access, free of charge data provided by official mapping agencies or Copernicus Evaluation of the approach against field data have been done

Substask 2.1.1

Main idea: in an automatic process analyze the data coming in from open satellites. Identify changes and features which complement the information available in maps and aerial photos: clearcuts, decay, new paths/roads





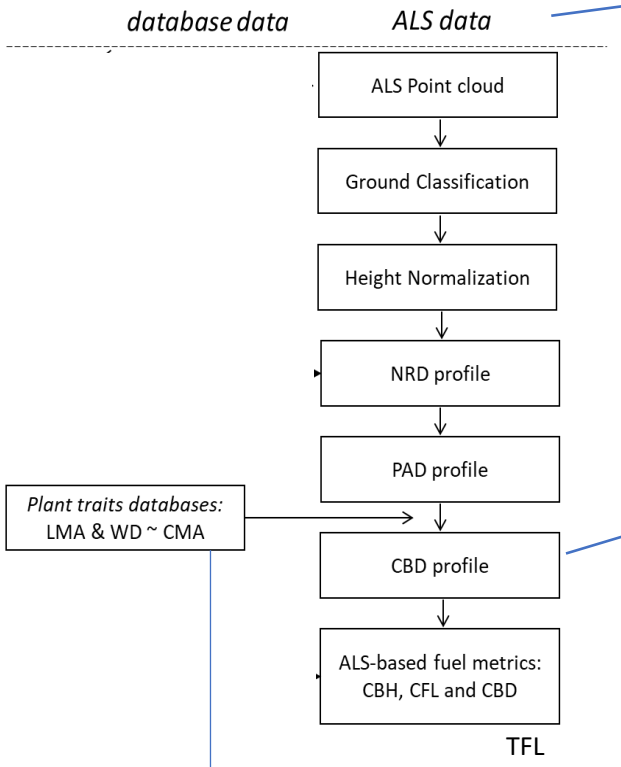


Detection of harvested areas with machine learning and Sentinel2 satellite imagery. Detection of harvests carried out both before and after the acquisition date of the aerial image (background)

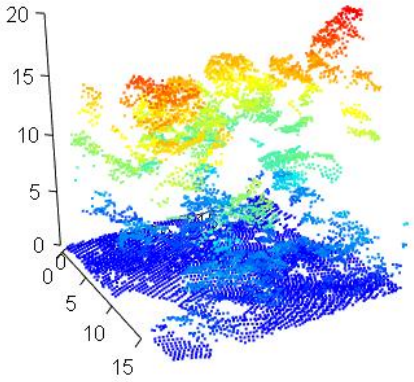
Substask 2.1.2
Fuel load and structure metrics from LiDAR data

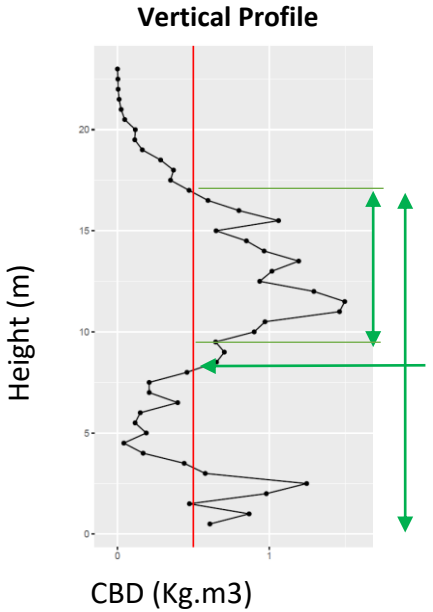
Main idea: An innovative processing chain to derive fuel load and structure metrics from LiDAR data and plant traits

From the point cloud to Canopy Bulk Density (CBD) profiles and fuel metrics



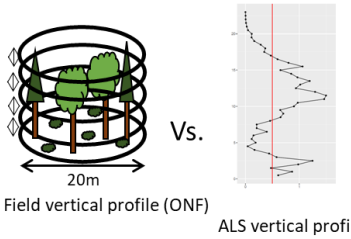
But also, Fuel height, vertical continuity …





Canopy & Total Fuel Load (CFL & TFL)

Canopy base height (CBH)



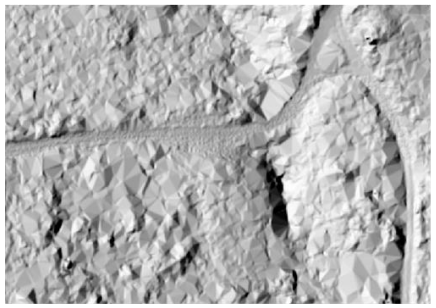
- Field data from France : 183 plots of French National Forest Service (ONF)
- ALS data (LiDAR HD IGN) >10 pts/m²
- Results :
  - **Good correspondence between field data and ALS profile above 1 m**
  - **No correspondence below 0.5 m**
- Potential improvement to come below 0.5m with better ground classification

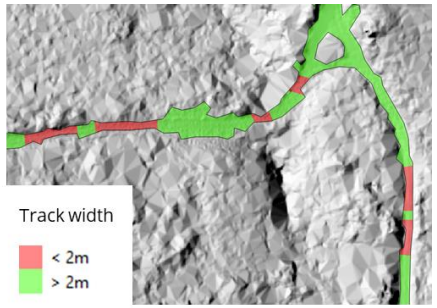
CMA = Canopy mass area (kg.m²). Estimated from two classical plant traits (*Diaz et al 2023; Chave et al 2009)*

- LMA (Leaf Mass Area : kg.m²)
- WD (Wood Density : kg m3)

Substask 2.1.2

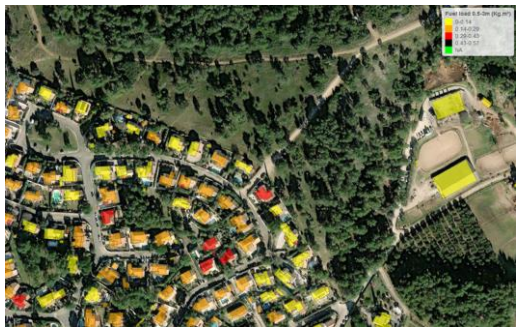
Main idea: define an automatic process to find forest tracks and estimate their trafficability, using high resolution LiDAR data. Define tracks limits and calculate width, slope, low vegetation coverage and trafficability + AI training dataset





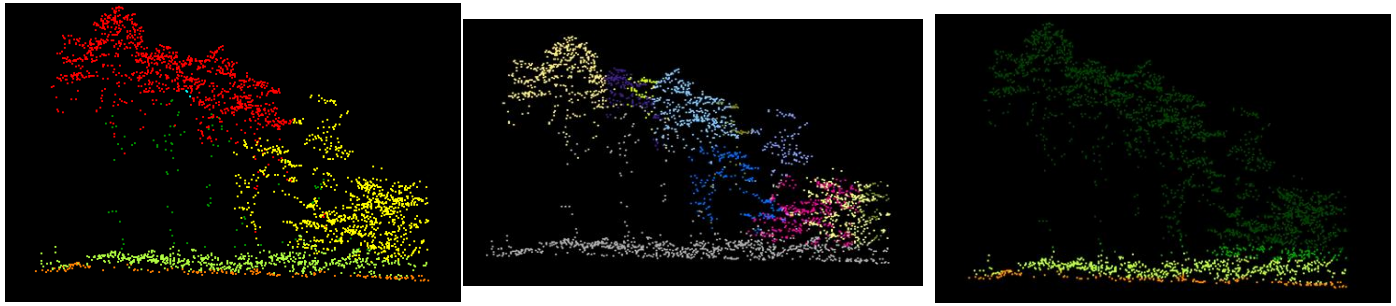
hard to reach
one-way
two-way
manoeuvre

Main idea: analyze the distribution of vegetation and the fuel load in the WUI to manage the reduction of a wildfire threat.



Main idea: estimate new vegetation morphological variables improving LiDAR point cloud classification and segmentation using AI.

Ground
Scrubs/understory
Medium veg/trunks
Riparian veg trees
Pinus



Ground
Scrubs/understory
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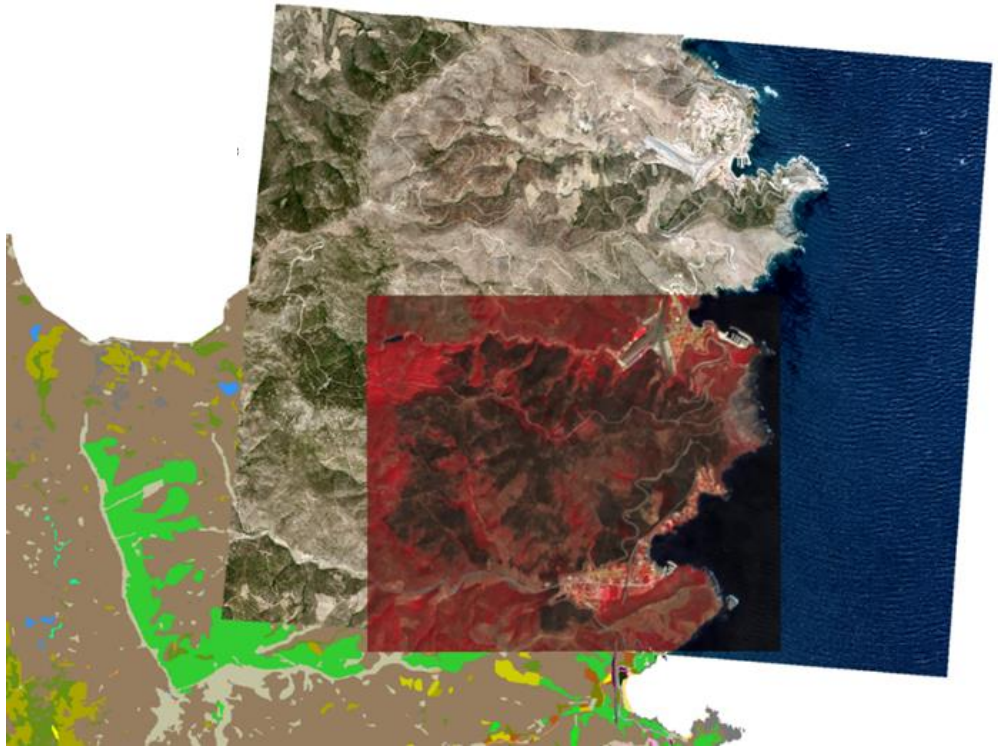
Final Remarks

- A huge effort done to use new LiDAR data and methodologies to allow scalability of solutions. Innovative results have been carried out in different LLs. to use LiDAR new model metrics for fuel determination
- The synoptic and global coverage of Copernicus program allow us to reproduce the innovative workflows on forestland change detection. However, the effect of prediction accuracy, and in particular presence of false positives should be spotlight.
- I.A. 2.1 results let us to evaluate key metrics of the forestland state and changes (protection areas status, trafficability, resilience…)
- Currently, it has been introduced AI into some of the methods. to improve and expand the work done so far



- Two small videoclips to introduce the IA. 2.1 have been done for FIRE-RES webpage
- Deliverable 2.1 has been consolidated and available