

Outputs of the CROSSIT SAFER Project: research and cooperation to manage natural hazards.

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*Third International Conference on Fire Behaviour and Risk
Alghero (Sardinia, Italy), 3-6 May 2022*



CROSSIT SAFER

Cross-border cooperation between Slovenia and Italy for a safer region

Čezmejno sodelovanje med Slovenijo in Italijo za varnejšo regijo

Cooperazione transfrontaliera tra Slovenia e Italia per una regione più sicura



9 Partners over 2 nations

2 Municipalities

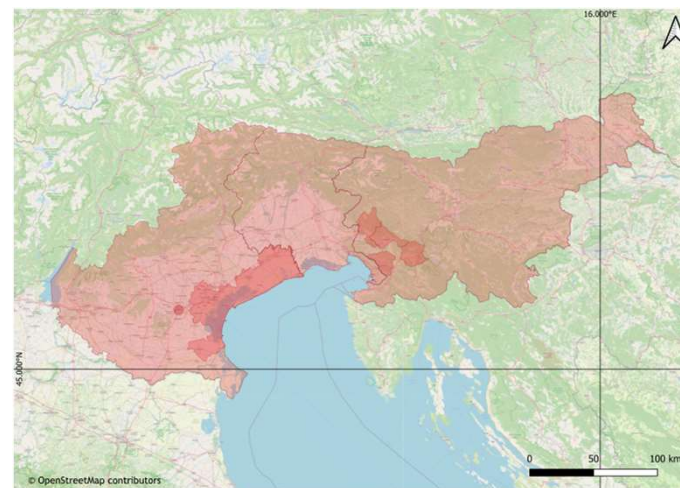
1 Supra-municipal administration

2 Regional Civil Protection bodies

2 Municipal Firefighters association

1 National Firefighters association

1 University



Città metropolitana di Venezia



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Aim of the Project

To strengthen **cooperation** among **Civil Protection** actors to plan joint solutions for prevention, preparedness and response to **natural emergencies**.

- collaboration between institutions
- harmonisation of procedures
- coordination during emergencies
- joined trainings

↳ *Natural hazards do not stop at borders*

<https://www.ita-slo.eu/en/crossit-safer>



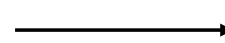
Challenges of the Project

- Different administrations, at different level
- Languages
- Different customs; different data
- Goodwill, but better formal agreement
- Collaboration mandatory: risky area



$R = V \times H$ V = densely populated areas

H= susceptible to natural hazards



wildland fires, too

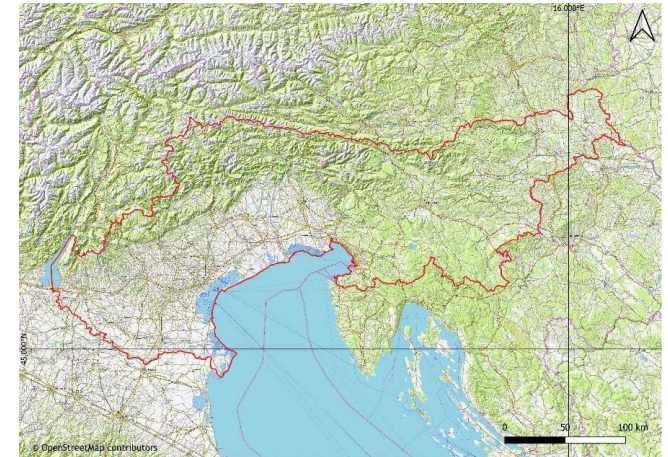




CROSSIT SAFER and wildland fires

High wildland and interface fire risk in Project area:

- Strong winds (**bora**, sea/land breeze)
- Built-up vegetation (pine forests, karstic scrubland)
- “Frequent” lightnings ignitions
- Densely populated area, infrastructures
- Campsites in pine forests along coasts



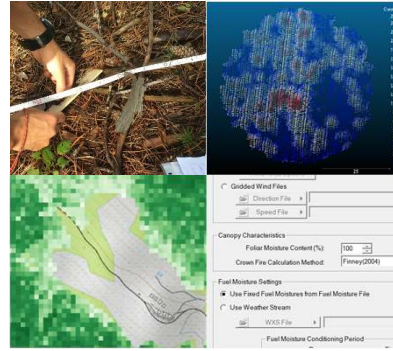
Fire risk maps

Prevention is better than cure

Both **wildland** and **interface**

Improving existing methodologies with:

- Fire simulation (potential hazard)
- LiDAR data (inputs for simulations and mapping)



Field sampling



Fuel model selection



Statistical coupling with LiDAR



Spatialisation



Fire behaviour simulation



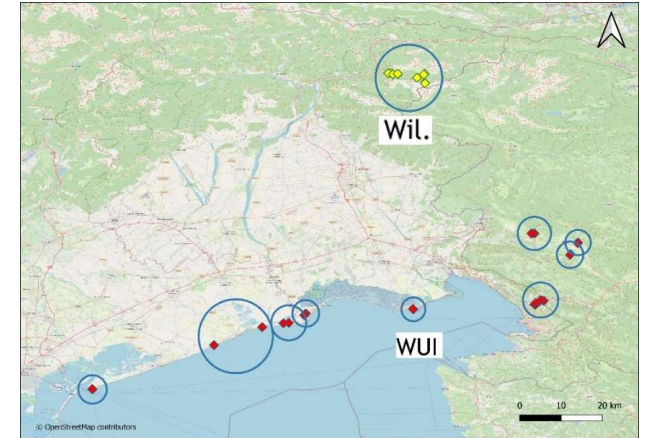
Hazard

$$R = V \times H$$

Fire risk maps

Field sampling

- Brown* intersect method
- 9+1 areas (interf.+wild.), ca. 30 plots
- Dry weight of duff, litter, herb. fuel



Field sampling

- ↓ Fuel model selection
- ↓ Statistical coupling with LIDAR
- ↓ Spatialisation
- ↓ Fire behaviour simulation

*

Brown, J.K., Oberheu, R.D. and Johnston, C.M., 1982. Handbook for inventorying surface fuels and biomass in the Interior West. *Gen. Tech. Rep. INT-129*. Ogden, UT: US Department of Agriculture, Forest Service, Intermountain Forest and Range Experimental Station. 48 p., 129.



Fire risk maps

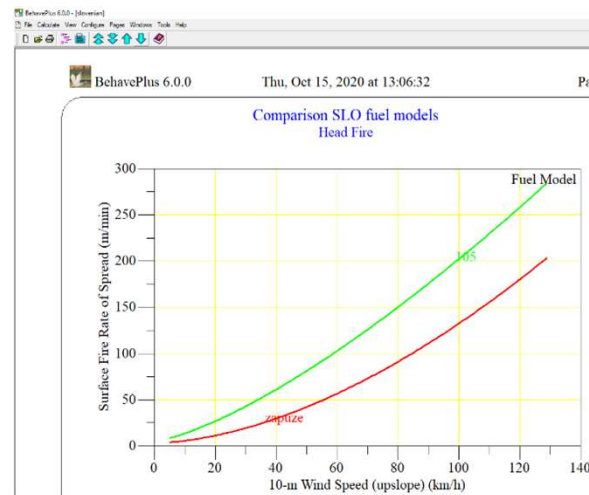
BEHAVEPlus

- Comparison of field data with Scott and Burgan's** models
- New fuel models: *Pinus mugo* Turra, *Larix decidua* Mill.



- Field sampling
- ↓
- Fuel model selection
- ↓
- Statistical coupling with LIDAR
- ↓
- Spatialisation
- ↓
- Fire behaviour simulation

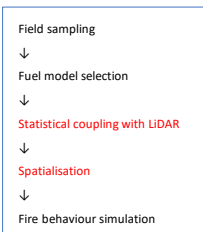
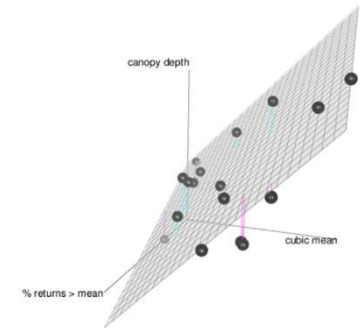
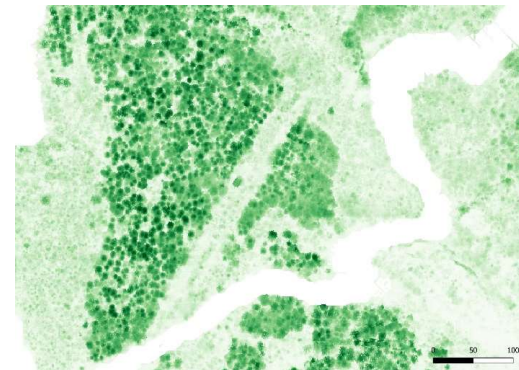
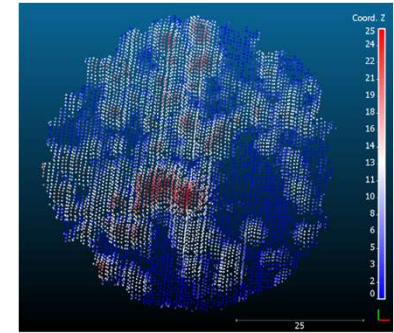
**
Scott, J.H. and Burgan, R.E., 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. *Gen. Tech. Rep. RMRS-GTR-153*. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p., 153.



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Fire risk maps

- Regression between field data (Y) and LiDAR metrics (X_i)
- LiDAR metrics with FUSION: percentiles, descriptive statistics, permeability, etc.
- GIS spatialisation (inference)



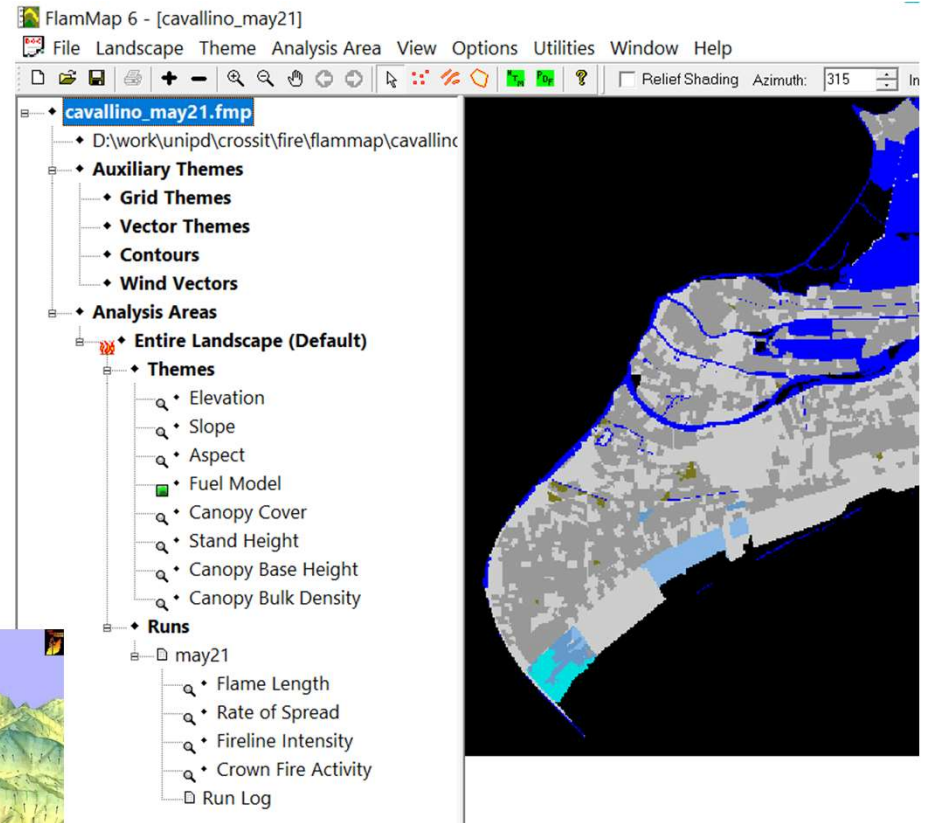
Fire risk maps

Fire behaviour simulation: FLAMMAP

Used outputs:

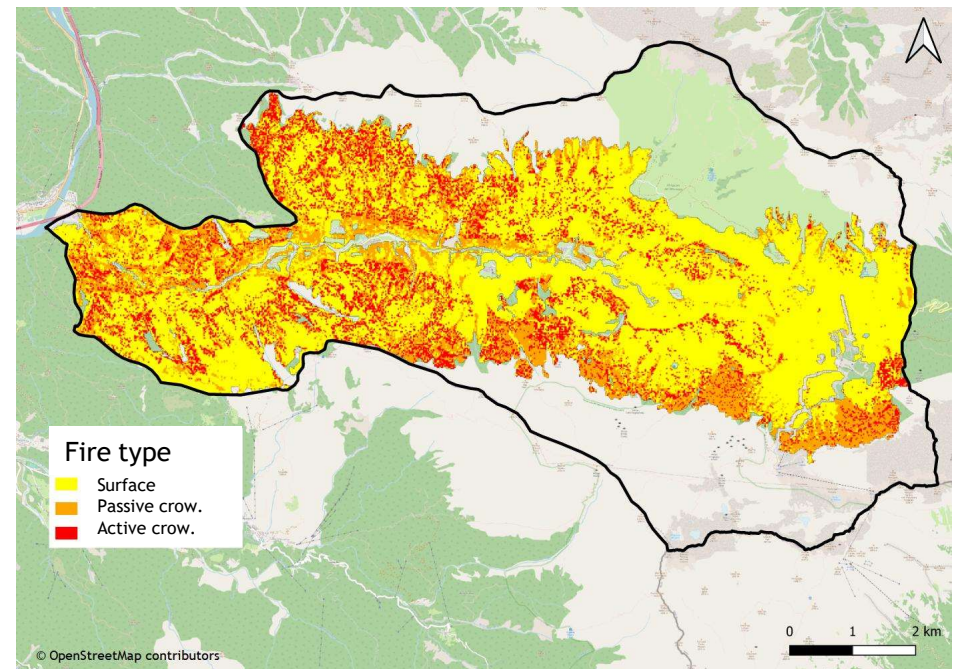
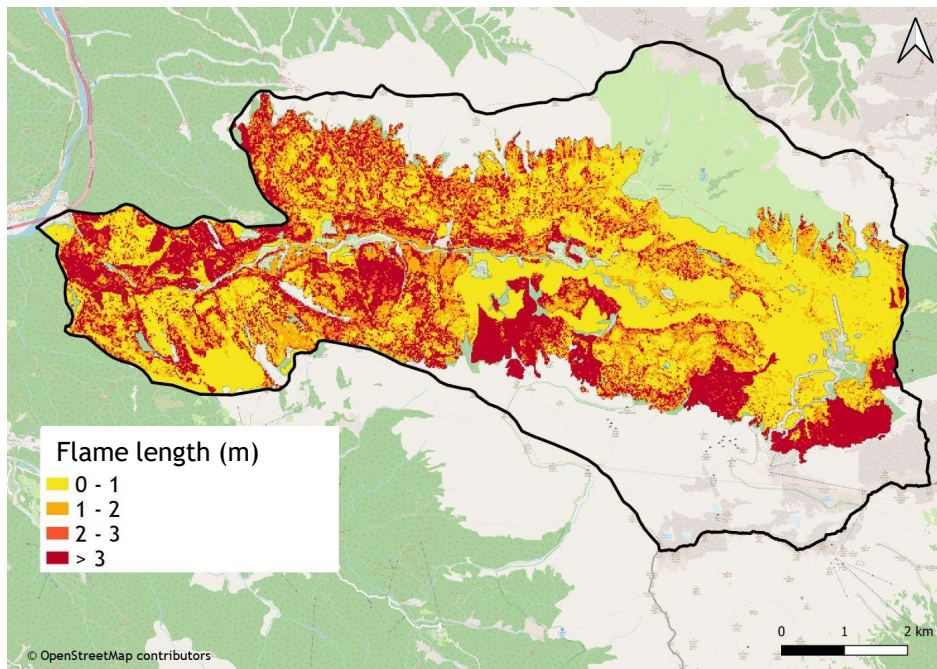
- Rate of spread
- Flame length
- Fireline intensity
- Fire type (crowning)

- Field sampling
- ↓
- Fuel model selection
- ↓
- Statistical coupling with LIDAR
- ↓
- Spatialisation
- ↓
- Fire behaviour simulation



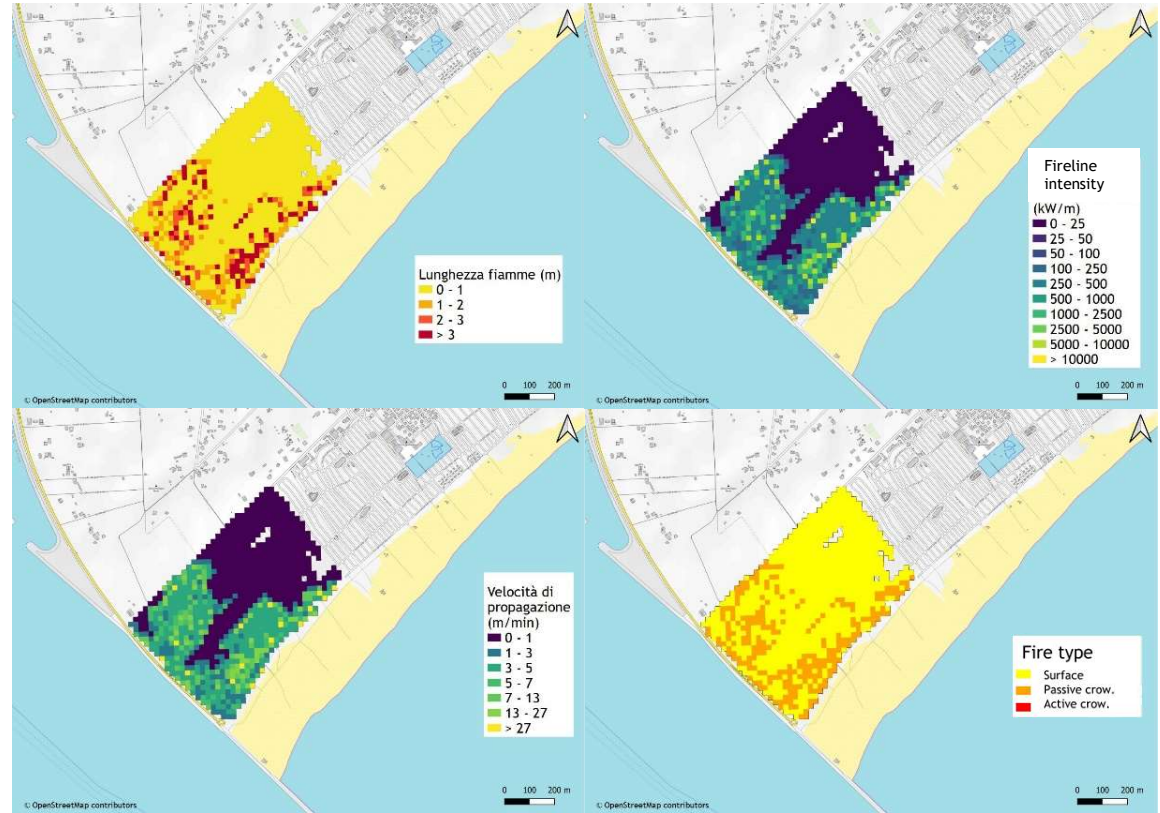
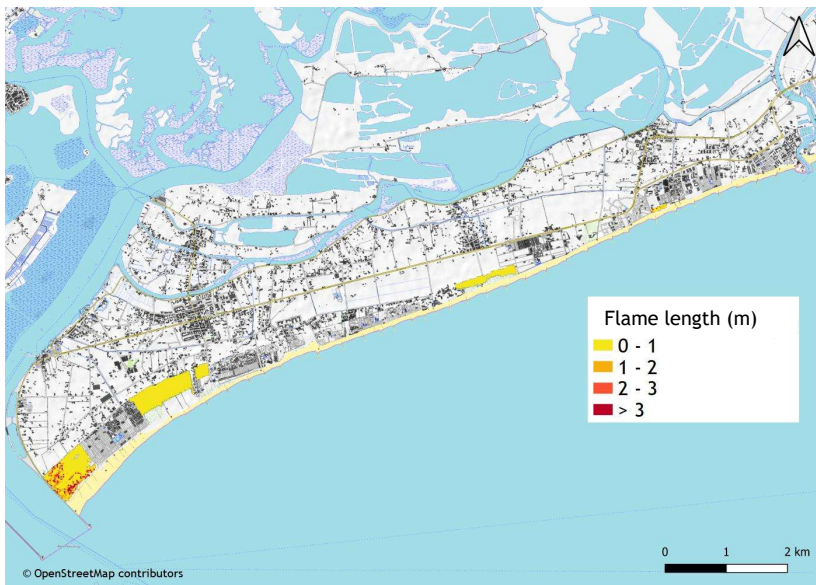
Fire risk maps

Wildland fire risk



Fire risk maps

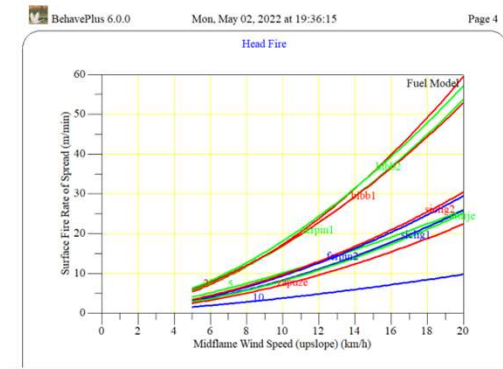
Interface fire risk



Simulation improvements: custom fuel models

Custom fuel models for FLAMMAP

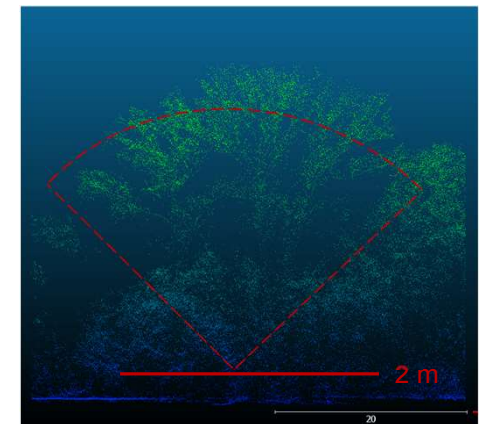
- *Pinus nigra* J.F. Arnold forests in all areas (WUI, Alps, Karst)
- Other fire-prone formations (mugo, larch, etc.)



Simulation improvements: CBD

Estimate of crown bulk density (CBD)

1. Bubble level and DIY stand
2. Hemispherical photo with smartphone and clip-on lens
3. Georeferenced
4. LiDAR data coupling

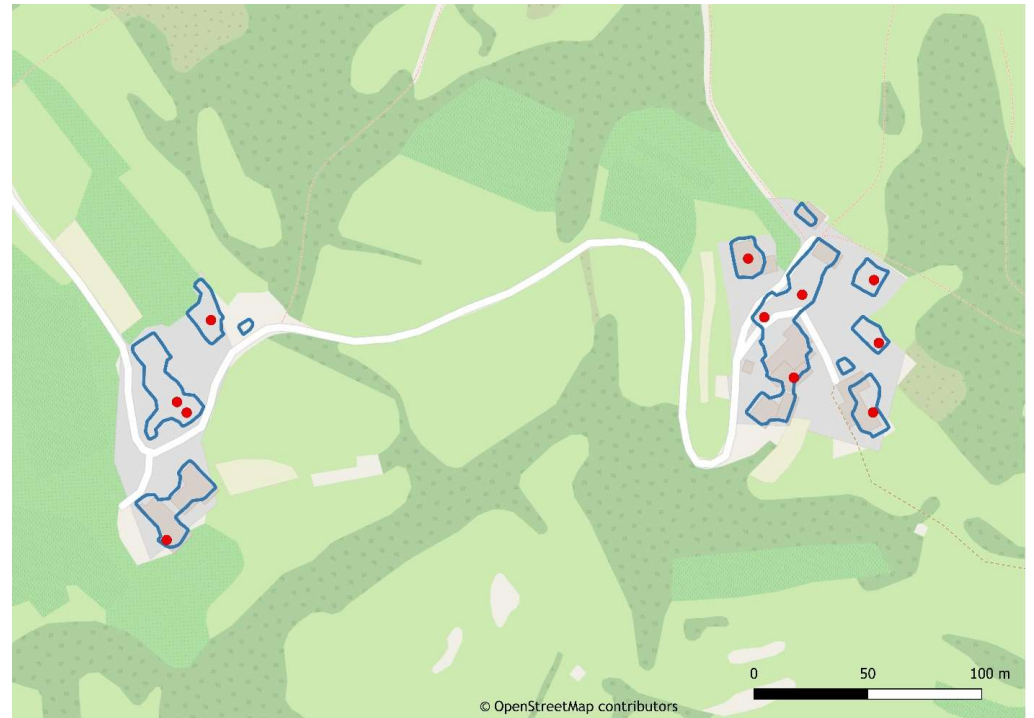


Simulation improvements: LiDAR identification of buildings

LAS classification (**class 6**)

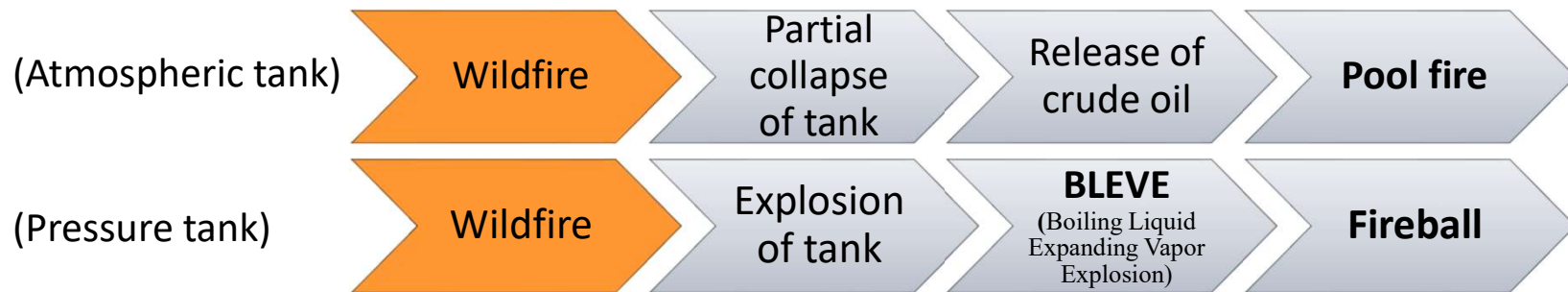
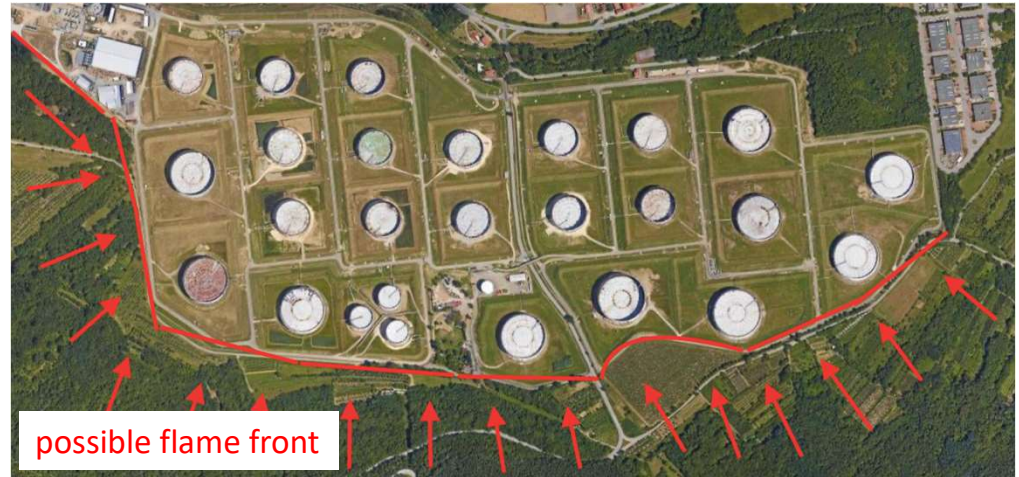
Not 100% accuracy

Included in LiDAR dataset



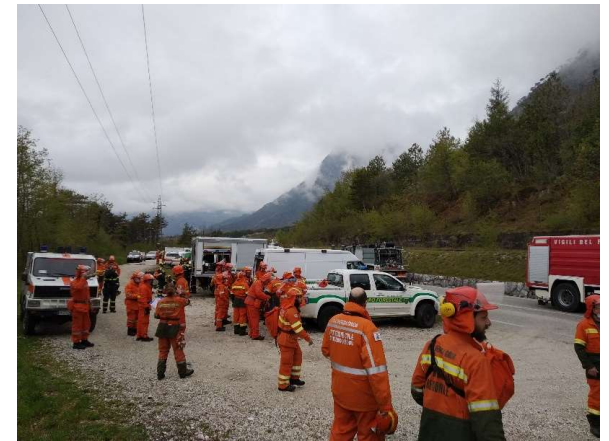
Interface particular scenario: Industrial fire risk

- Case studies
- FDS/W-FDS



Other activities: Exercises (drills)

13+ exercises, included trans-boundary and table-top



Other activities: Training



Theoretical and practical

Coming up next → **courses** on:

- Satellite data for fire severity
- FLAMMAP for fire hazard



Conclusion

Thanks to the **activities**, the signature of a **formal protocol of agreement** and new **guidelines** to map and evaluate natural hazards, the area will become more secure.



Final meeting and protocol signature

Gorizia/Nova Gorica

10 June 2022

<https://www.ita-slo.eu/en/crossit-safer>



**Thank you for your attention
Hvala za vašo pozornost / Grazie per l'attenzione**



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Extra



Pnevmatski šotor
Tenda pneumatica

