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# Improving Wildfire Risk Assessment with Soil Moisture Data



**A case study on how the Civil Protection of Veneto used Finapp technology to strengthen regional wildfire preparedness**

# The challenge

**Can soil moisture make wildfire assessment more reliable?**

The **Civil Protection of Veneto** is a partner in the MOSAIC project (Managing prOtective foreSt fAcing clImate Change), funded by the Interreg Alpine Space Programme. The initiative aims to support climate change adaptation, disaster risk prevention, and resilience by promoting ecosystem-based approaches.
Within this broader framework, improving wildfire risk assessment is a key priority, as climate change increases the frequency and intensity of extreme events. Gaining a more accurate understanding of wildfire risk becomes essential for effective prevention and preparedness at the regional level.

**User:** **Protezione Civile Regione Veneto**

**What:** **Six Finapp probes for wildfire assessment**

**Location:** **Veneto - Italy**

**Problem:** **Better estimation of wildfire risk**

**When:** **2022-2025**

**Result:** **First site-specific wildfire early-warning**

Today wildfire risk is commonly assessed using the **Fire Weather Index - FWI**, which combines weather-driven fire spread - ISI and **fuel availability - BUI**. While ISI depends on real-time meteorological conditions, BUI acts as a proxy for soil moisture but is calculated from past rainfall.

- BUI is used as proxies to estimate soil moisture, rather than measuring it directly
- The actual water content in the soil — a key driver of fire susceptibility — is not used

Without direct measurement of soil moisture, wildfire risk models may fail to fully capture real fuel conditions, limiting the accuracy of risk estimation and early warning systems.

# The Finapp Approach

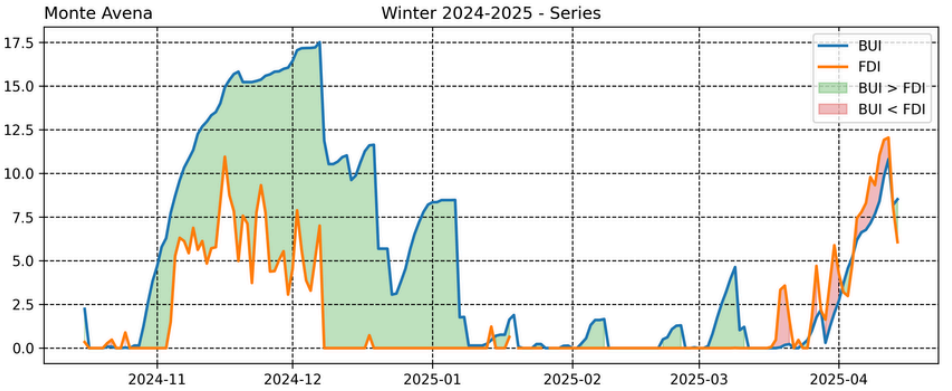
**Finapp** deployed **CRNS**-based **soil moisture** probes to continuously monitor water content in the soil on a **large scale, in depth and in real time** at six different forest sites in the Veneto region to best capture the diversity of conditions. The objective: combine real soil moisture data to classic weather data to improve wildfire risk assessment.



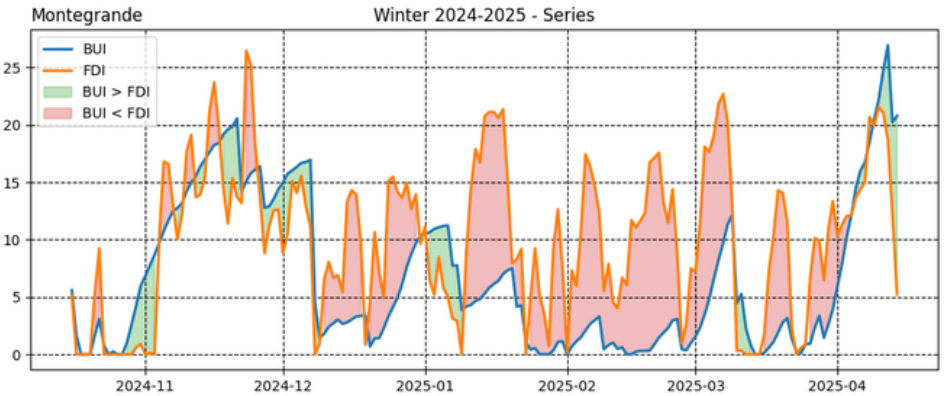
**Key Findings from the 3-Year PoC**

During the PoC with the Protezione Civile del Veneto, Finapp **compared BUI with directly measured soil moisture, finding a strong non-linear correlation: as soil moisture increases, BUI decreases.**
Replacing the traditional BUI with **Finapp Dryness Index - FDI** produced a modified FWI that closely matches real conditions, while revealing key differences:

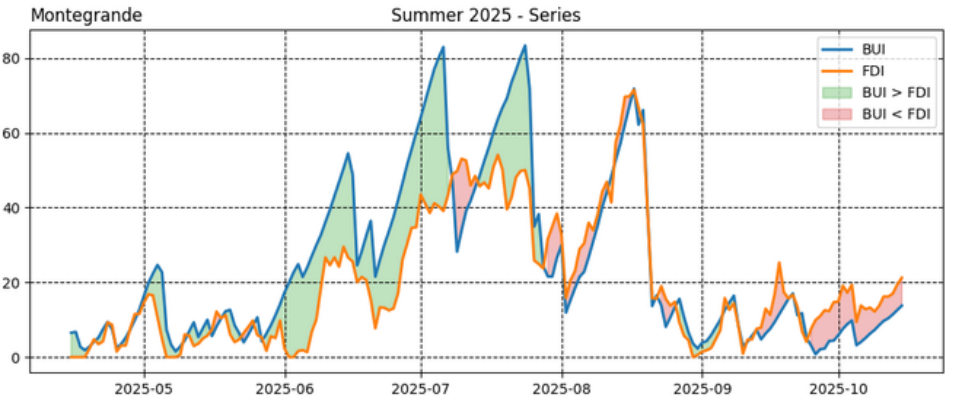
- **Winter with snow cover:**
the FDI correctly drops to near zero, reflecting the absence of fire risk, while the traditional model may still indicate non-zero values.




- **Winter without snow cover:**
the FDI captures higher risk levels, consistent with observed dry fuel conditions




- **Summer:** despite high temperatures, the FDI often shows lower risk levels, reflecting frequent precipitation and higher soil moisture during the warm season




# Benefits

Integrating direct soil moisture measurements into wildfire risk models provides:

- More accurate risk estimation, based on real fuel conditions rather than indirect proxies
- Improved seasonal reliability, capturing critical dynamics such as snow cover and dry winter events

# Conclusion

The collaboration with the Protezione Civile del Veneto demonstrates how direct soil moisture measurements can significantly enhance wildfire risk assessment.
By moving from indirect estimation to real-world observation, Finapp technology enables a more reliable, seasonally consistent, and operationally relevant understanding of fire risk—supporting more effective prevention and resource allocation.

*"Finapp has developed a dryness index that has shown a strong correlation with existing ones. We were pleasantly surprised by this. We are integrating Finapp into our wildfire risk monitoring platform."*
Rolando Rizzolo, PhD, Head of the Civil Protection Planning Office



## About Finapp

**Finapp** develops advanced soil moisture monitoring solutions based on Cosmic Ray Neutron Sensing - **CRNS technology**.

Building on this and other field experiences, Finapp has developed **Fin4Earth**, a web-based platform designed for the **early warning of landslides, wildfires, and floods.**

Fin4Earth stands out from traditional approaches in several ways:

- It **integrates real soil moisture data** measured by Finapp probes into conventional models and formulas, significantly **improving overall performance**.
- **Site-specific system** tailored to each location, incorporating local characteristics and historical events to define **custom risk thresholds**.
- By combining site-specific **weather forecasts** with **proprietary AI** algorithms, Fin4Earth is able to project risk up to **72 hours in advance**, enabling timely and informed decision-making.

By turning complex environmental dynamics into clear, actionable insights, Finapp supports infrastructure operators and public authorities in moving from reactive responses to proactive risk management.

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