# FLIRE: AN EO-BASED DSS FOR COMBINED FLOOD AND FIRE RISK ASSESSMENT IN PERI-URBAN AREAS

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## INTRODUCTION

**Fires** and **floods** are among the natural hazards with the higher social impacts in the 21st century. When these occur in **urban** and periurban areas, the **loss** of human lives, the destruction of properties, the **degradation** of health and **quality** of life, as well as the disruption of **economic** activities are among

the **impacts**. The study of both hazards is based on the same background data and **Earth Observation** (EO) is a crucial information source. The same **EO** data can derive a fuel map in case of fire modeling, while the parameterization of flood modeling need dedicated **land cover/use**  (LULC) information, updatable when needed (after a fire or flood) and suitable for the specifications of the models. The investigation of both fire and flood hazards traditionally has been conducted separately even if the same data are needed. The "collect once – use for many purposes" model

has been adopted for the design of the FLIRE DSS in the framework of LIFE + FLIRE. This **result** in the **increase** of the accuracy and **economies**, as both **phenomena** are **tightly** interrelated and **need** the same input data.







## STUDY AREA AND DATA



Study area

## SYSTEM DESIGN





Landsat OLI classification

### Input Data

- Landsat OLI Satellite data
- EEA Urban Atlas
- > Weather forecast data (forecast)
- > Weather station data (real time)
- > Fire model (web-service)
- > Flood model (hydrological and hydraulic)> FLIRE server and GUI

Landsat 8 image classification using SVM for LULC dataset. Hybrid LULC scheme with combination of Urban Atlas, compatible with the model requirements.

### **FLIRE DSS**

The FLIRE DSS is consists of three modules and seven applications unified under the





#### **EFiWS**

✓ Geographic Fire Management Information System (GFMIS): Modified BEHAVE fire model

### **FLORAS**

✓ Floodplain Data: HEC-HMS for
hydrological modeling (catchment basin

#### **FLIRE Server:**

- ✓ Fire management (EFiWS)
- ✓ Flood management (FLORAS) and
- ✓ Weather management (WIMT)
- ✓ FLIRE Server
- ✓ Graphical User Interface (GUI)

# RESULTS





System Design Architecture

as web-service.

✓ Fire Danger Index: Keetch-Byram fire danger index, adapted to the local conditions. Shows the potential of the fire spread IF a fire occur in a given day/time

### WIMT

- ✓ Weather forecast data in a 2\*2 km grid, based on MM5 weather model (NOA)
- Weather data from a network of weather stations.

level) and HEC-RAS coupled with SWMM for hydraulic modeling (urban level).

- ✓ Smart Alerts 3 levels of alerts:
- 1st level: real-time records of flow gauges
- 2nd level: ZEUS lightning detection network data for lightning occurrence
- 3rd level: weather forecast provided by NOA

✓ Planning Tool: Cost-Benefit analysis for different scenarios.





#### The Fire Danger Index

#### Flood model results in the urban area



> FLIRE DSS is a valuable tool for the early depression of a fire during an emergency, as well as during the planning phase for the evaluation of "what-if" scenarios.

> FLIRE DSS can be used during the planning phase in flood-prone areas, as well as an early warning tool for flood events.

> EO has an important role in providing FLIRE DSS with the necessary input data for simulation models parameterization, as well as for continuous monitoring of the affected areas.

> The potential of Copernicus Sentinels 1 and 2 exploitation in FLIRE DSS is high, for fires and floods combined assessment and management.

## REFERENCES

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