

Date Submission	of	Torino, 28 march 2019
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IPL Project Proposal Form 2019

1. *Project Title:* **“Wildfire-related landslides in Italy: triggering mechanisms and propagation processes”**

2. *Main Project Fields*

Select the suitable topics. If no suitable one, you may add new field.

(1) Technology Development

A. Monitoring and Early Warning, B. Hazard Mapping, Vulnerability and Risk Assessment

(2) Targeted Landslides: Mechanisms and Impacts

(4) Mitigation, Preparedness and Recovery

3. *Name of Project leader*

Giuseppe Mandrone

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Core members of the Project

Anna Maria Ferrero: Full Professor, Earth Sciences Department, University of Torino (ITA)

Giandomenico Fubelli: Associate Professor, Earth Sciences Department, University of Torino (ITA)

Giovanna Capparelli: Researcher, DIMES, University of Calabria (ITA)

Mario Parise: Associate Professor, Earth and Geo-environmental Sciences – University of Bari (ITA)

Veronica Tofani: Researcher, Earth Sciences Department - University of Firenze

4. *Objectives:*

- ✓ Identification of fire severity and correlation with effects on soils;
- ✓ Study of triggering conditions and propagation of wildfire-related landslides;
- ✓ Identification of the variables which affect landslide susceptibility;
- ✓ Realization and validation of a standard survey protocol;
- ✓ Site scale and laboratory tests aimed at retrieving hydrological and geotechnical parameters;
- ✓ Modelling of recent wildfire-related landslides;
- ✓ Susceptibility and hazard mapping in test areas;
- ✓ Information dissemination and guidelines.

5. *Background Justification:*

In Northern Italy an unusually intense fire season occurred in autumn 2017, as a result of extreme drought, high temperatures and high-speed hot winds. The same situation was repeated in winter 2018-19, probably a signal of climate changes that affect Mediterranean regions, in particular. In the springs, rainfalls in NW Italy is usually intense and abundant. Rainfall on burned soils and many instability phenomena (mainly soil erosion and debris flows) impact territories already affected by

wildfires. Debris flows, fed by intense erosion, seriously damage homes, villages, and roads, putting highly populated areas at risk. In central and southern Italy these phenomena are much more widespread and more frequent, but there are currently no systematic studies nor official rules of conduct.

6. *Study Area:* The first test sites are in Piedmont, with subsequent data gathering and statistical analyses at sites throughout Italy.
7. *Project Duration:* 3 years
8. *Resources necessary for the Project and their mobilization*

Members of the core unit (UNITO) have enough funds to finance studies. There are two PhD fellows active on these problems and three full time professors dealing with geomorphology, engineering geology and geotechnics. Partners of associate units are among the more important Italian institutions dealing with landslides and will provide expertise in hydrology-hydraulic (UNICAL), field measurements and susceptibility mapping (UNIFI), field surveys and past experience in wildfire-induced landslides in the U.S.A (UNIBA). All partners belong to the Italian ICL network, showing a pro-active cooperation between associates in this new entity and ensuring a multidisciplinary approach to such a big item. The ICL financial support will eventually support disseminations and public engagement activities such as a specific website, periodic dissemination initiatives and non-technical publications. By the way, guidelines to minimize the impact of wildfire-induced landslides should be an important goal to reach at the end of the project.

9. *Project description:* (30 lines maximum)

Wildfire-induced landslides usually affect hills and the foots of the mountain. In Italy these areas are usually very populated and highly cultivated. Interaction between human activity and these gravitational-phenomena are a significant problem for public institutions, in terms of civil protection and emergency, planning, recovery, and mitigation activities. At the moment, no specific research is underway on this topic and no guidelines are available for public and private operators.

The project requires different activities: first, analysis and description of previously-studied recent landslides in Piedmont. Here the geological, geomorphological and environmental settings are well known, and rainfall data are available at a very detailed resolution. Runout path and deposition zones have already been mapped, and a preliminary estimate of motion characteristics are work in progress. The geological and geomorphological characteristics will be compared to the wildfire features retrieved from field surveys, for a deeper event comprehension.

In source areas, geotechnical, hydraulic and geophysical surveys will be planned, as well as laboratory tests on soil samples, in order to understand the processes underlying the triggering of the phenomena. An objective is to determine if the primary mechanism of landslides in burned areas is a runoff-dominated process with progressive sediment entrainment, or an infiltration-triggered failure of discrete soil slips. For this purpose, recently burned areas will be sampled and tested. After that, advanced numerical modelling will be performed.

Italian and southern European analogues will be selected, and data will be collected and inserted into a

standardized database, in order to plan statistical analyses and GIS elaborations. Run out modelling will permit estimations of potentially involved areas for the prediction of future landslides. This will be the basis for susceptibility mapping and land planning.

As a conclusion, during the three years of the project we aim to disseminate the acquired knowledge through publications, conferences, guidelines and inventory forms.

10. *Work Plan/Expected Results*: the project encompasses sequential stages, and will be divided into 4 main Work Packages: Wp1 - on-site surveys and laboratory tests, Wp2 - GIS inventory, hazard and risk mapping, Wp3 - numerical modelling, and WP4 - dissemination and guidelines. It is possible to assess the following timetable, divided in semesters:

wp/time	I sem	II sem	III sem	IV sem	V sem	VI sem
WP1						
WP2						
WP3						
WP4						

11. *Deliverables/Time Frame*: the project will start in winter 2019 and will end in 2022 (3 years).

During the first year, standard survey protocols will be performed and tested. In addition, soil sampling and laboratory tests will be conducted. A normalized database will be constructed and populated.

In the second year, numerical modelling and GIS analyses will be performed.

The last year will be devoted to the production of thematic maps, guidelines and disseminating the acquired knowledge.

12. *Project Beneficiaries*:

Civil protection responsible for human safety at the local and regional scale; landslide professionals, researchers, planners and people living near burned areas.

13. *References* (Optional): (6 lines maximum; i.e. relevant publications)

- Lainas S., Sabatakakis N., Koukis G. (2015) Rainfall thresholds for possible landslide initiation in wildfire-affected areas of western Greece, Bull. Eng. Geol. Environ. (2016), 75: 883-896.
- Moody J. A., Shakesby R. A., Robichaud P. R., Cannon S. R., Martin D. A. (2013) Current research issues related to post-wildfire runoff and erosion processes, Earth-Science Review, 122 (2013): 10-37.
- Parise M., Cannon S. H. (2008) The effects of wildfire on erosion and debris-flow generation in Mediterranean climatic area: a first database. Proc. 1st World Landslide Forum, Tokyo, pp. 465-468.

Note: Please fill and submit this form by 30 March 2019 to ICL Network <icl-network@iclhq.org> and ICL secretariat <secretariat@iclhq.org>