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Combined use of historical forest fire data and risk assessment evaluations for optimal planning of the firefighting system over a given region.

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Regional fire managers and planners need to determine the appropriate size and location of the resources used in emergency or in pre-operational phase. It is worth observing that only a reliable and objective static risk assessment can assure the achievement of a satisfactory planning policy, especially if the available economical resources are limited and scarce.

The availability of a consistent and representative dataset relevant to the historical wildland fires allows characterizing the static hazard over the considered area of study in terms of probability of occurrence and magnitudo of wildland fires for each considered cell. Actually, the propagation dynamics is heavily influenced by the physical characteristics of the interested territory, as well as by the climate and the fuel conditions. Therefore, it seems sensible to perform a static hazard assessment not only on the basis of the history of actually occurred fires, but also the data generated by a risk assessment module over a considerably long past time interval. Such data may refer, for instance to the potential linear intensity (kW/m) of a fire that could occur for each given location (cell) over the considered territory.

In order to evaluate the wildland fire risk, a vulnerability function can be introduced, with the purpose of modeling the relationship between the hazard and the resource displacement over the territory. In particular, vulnerability can be assumed to be a function of the intervention efficiency, defined in terms of available resources (weighted by their distance to the considered cell) that can cope with a fire in case of an emergency or, in pre-operational phase, can reduce the probability of ignition. In addition, the vulnerability of a territorial cell is usually dependent on the physical (geographical)

characteristics of the cell.

A mathematical programming approach has been introduced aiming at formalizing and solving an optimization problem, whose objective is the minimization of wild-land fire static risk at a regional level by suitably defining the configuration of the fire fighting system. The optimization problem is constrained by the total amount of (economical) resources available for the planning phase in the whole target area.

A specific case study in Liguria region (Italy) is presented, in order to highlight the feasibility of the proposed approach.