



## **Trend analysis of the effects of Damaging Hydrogeological Events on people in Calabria (Southern Italy)**

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Damaging Hydrogeological Events (DHEs) are severe weather periods during which floods, landslides, lightning, windstorms, hail or storm surges can harm people. This work aims to highlight the potentiality of historical databases of damage caused by DHEs in the study of the effects on people. Particularly, the analysis aims to detect modifications of risk conditions for people throughout the years, related either to change in the characteristics of the events or to societal changes and modifications of people behaviour.

In order to do this, we investigated the impacts of DHEs on people in Calabria (Italy) over 37 years (1980–2016). We gathered data by mean of the systematic analysis of regional newspapers and we collected them in the database named PEOPLE. The damage was codified in three severity levels as follows: fatalities (people who were killed), injured (people who suffered physical harm) and involved (people who were present at the place where an accident occurred but survived and were not harmed).

Throughout the study period, the analysis shows that, due to their daily displacements to reach places of work, Calabrian males were more frequently killed, injured and involved outside (generally on the roads). On the contrary, females, among who the percentage of working persons was lower, were more often affected indoor. Younger females tended to be more cautious than same-aged males, while older females showed an intrinsic greater vulnerability, resulting in relatively higher number of fatalities.

Involved people, both males and females, were younger than injured people and fatalities, suggesting that younger people show greater promptness in reacting to dangerous situations. Floods caused the majority of the fatalities, injured and involved people, followed by landslides. Lightning was the most dangerous phenomenon, and it affected a relatively low number of people, killing 11.63% of them and causing injuries to 37.2%. Moreover, this kind of phenomenon affected a decreasing number of people during the second half of the study period. This trend can be partially related to the progressive shift of the population from rural to urban areas, as also detected in other countries, during the twentieth century.

Fatalities and injuries mainly occurred outdoors, largely along roads. In contrast, people indoors were more frequently involved without suffering harm. Being “dragged by water/mud” and “surrounded by water/mud”, respectively, represented the two extremes of dynamic dangerousness. The dragging effect of rapid-flowing water totally or partially obstructed the attempts of people to save their lives. In contrast, people surrounded by steady water/mud encountered difficulties but ultimately could survive.

The study results are useful in highlighting the trend of risky behaviours undertaken by people throughout the years and the most frequent recent tendency to risky behaviours. This information can be used for informational campaigns to increase risk awareness among both administrators and citizens and to improve resilience, promoting self-protective behaviours and avoiding the underestimation of hazardous situations.