

EGU22-10272

<https://doi.org/10.5194/egusphere-egu22-10272>

EGU General Assembly 2022

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Structuring citizens' risk perception and knowledge of flooding events for planning purposes: The case study of Brindisi, Italy

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The effects of flooding on urban environment and social vulnerability are challenging issues in flood risk management and long-term planning. Flood risk is among the main causes of social crisis, as it can drastically affect the socioeconomic status of a community and an increase in flood events can significantly inhibit the political system of land and emergency management, social security, human welfare, and the economy.

In recent decades, several studies have illustrated how the probability of occurrence of a flood event can be modified by human-dependent factors, such as, among others, climate and land-use changes.

For this reason, flood risk management policies are evolving to redirect the actions of policymakers from purely physical defensive measures toward integrated management and planning strategies, placing greater emphasis on the complexity of the interaction between social and physical processes.

The complexity of physical processes lies in the wide variety of underlying phenomena that produce different types of flooding, while that of social processes can be reconducted to their characterization, given by human-related factors such as risk perception, emotions, bonds, context, and behaviors. Structuring the complexity of these two systems could support flood risk to define the elements/classes of citizens that make a social system vulnerable.

Based on these premises, the present work aims in modelling the relationship between flood risk and community, starting from an analysis of social perception and knowledge of protective measures, and exploiting a methodology based on an online survey used to collect data, and on Mann-Whitney and Kruskal-Wallis tests used for their analysis.

The methodology was experimentally applied to the city of Brindisi (Puglia region, Southern Italy), which is potentially subject to floods of different nature, as fluvial, coastal and pluvial floods and dam overflows.

The results suggest that perceptions of flood risk depend on intrinsic components of individuals, primarily related to dimensions of perception such as trust in public strategies and risk communication. Slightly higher perception emerged for those living in risk areas, but the results of

the remainder show that there is a non-negligible perception even where there is apparently no source of risk. This is reflected in the varying nature of the flooding that has affected the city. The presence of disabled persons in the household does not act in any way neither in the perception nor in the knowledge of the measures; the previous experience seems to have little weight in reference to the perception and almost null on the knowledge of the measures. This element is probably linked to the temporal distance from the last event that caused serious damage to the community. Knowledge of protective measures appears to be uniformly low for each category of citizens and territorial area, in particular for adolescents, a recurring category also on other investigated dimensions.

This work represents the first step for the development of a multi-agent model, as developed by the science of intelligent systems, able to analyze more deeply the relationships between natural and social systems and to bring out elements to support flood risk management.