

## Task Force Marche Italy Flood 2022

At the end of an extremely dry summer, the Marche region of Italy experienced a heavy rainfall event and flood with approximately half the typical annual rainfall in a matter of hours (Copernicus, 2022; Acquaroli, 2022). On the afternoon of September 15th, 2022 more than 400 mm of rain fell in less than three hours causing the Esino, Cesano, and Misa Rivers to flood. The town of Senigallia on the Adriatic coast was heavily affected as were smaller communities upstream. With high rainfall intensities and steep slopes in the upper catchments, this flood event transported large amounts of debris, caused widespread erosion, landslides, and destroyed infrastructure. The most affected areas were within the Marche region of Italy in the provinces of Ancona and Pesaro e Urbino, while a small area within the region of Umbria in the province of Perugia was also affected. The locations of the provinces can also be seen on the map.

According to news reports there were at least eleven fatalities and local people mentioned that they had received a normal rainfall warning but did not expect a damaging flood (Reuters, Euronews, 2022). The damages experienced due to this event include destroyed homes, collapsed bridges, blocked roads, and disruption to power, water, and telecommunication networks. Emergency services received more than 2,600 calls for assistance and more than 780 volunteers were reported to be working in affected areas following this flood event (Efas, 2022). The affected catchments are generally mountainous in the uplands and narrow areas with gentler slopes close to the coast with some historic infill. The average population density is below the Italian average (Marche: 164 inh./km<sup>2</sup>; Perugia: 105 inhabitants/km<sup>2</sup>; Italy: 201 inhabitants/km<sup>2</sup>) and there is an aging population in this area (istat, 2023).

Following the September flood, five NatRiskChange members from the 3rd program cohort form a Task Force to better understand the drivers and consequences of this flash flood. Contact was established with Italian scientists who were leading a consortium of researchers working on the flood event. For a first visit, NatRiskChange members joined a three day field trip in February 2023 with colleagues from CNR irpi and the University of Padua. The site visit included observations and surveys in the villages San Crescentino, Fossato, Petrarra, Frontone, Serra Sant'Abbondio, and Coldorso within the Pesaro e Urbino province. Within the province of Ancona Monterosso and to the village Isola Fossara in Perugia were visited. These places can also be seen on the map.

During this February site visit, surveys of high watermarks were conducted in the affected watersheds to support an analysis reconstructing the peak of the flood event. NatRiskChange members supported Italian colleagues in the field, looking for stable cross sections where high water marks from debris were both undisturbed and could be surveyed with a total station. This survey was conducted primarily in the headwater catchments as high water marks were best preserved in these areas. With this first field visit the NatRiskChange team developed a better understanding of the affected areas and flood processes.

Following this first field visit the focus of the task force was further refined. The two main aspects of interest are the warning situation and the damage and disruption to infrastructure. These aspects have not been looked at by others in the consortium of researchers working on this event. The warning situation is interesting as initial reports suggest that local residents did not expect the event to be so severe. In this case there are possibly parallels to the Eiffel Floods in Germany in 2021. While in the field, the group heard that while the direct damage was

important, the larger region was quite affected by blocked or damaged bridges and roads for a longer period of time and this had negative consequences for private individuals as well as businesses. To better assess the road damage a second field visit was organized for April 2023.

Currently the Task Force group is working with the data collected on flood early warning and infrastructure damage and disruption and working on possible outputs from this initiative.

## References:

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