

Causes of the exceptionally high number of fatalities in the Ahr valley, Germany, during the 2021 flood

General comments

The paper explains the factors which made the flood event the deadliest one in Germany in more than 40 years by studying the circumstances and backgrounds of the individual fatality reports. The paper is well written, easy to read and clear.

The most important factors that contributed to the large number of fatalities in this event are:

- The extreme severity of the flooding with both high water levels and extremely high flow velocities.
- The underestimation of the hazard and its potential consequences:
 - The underestimated flood forecasts 24 hours before the flooding,
 - The lack of awareness at the governments and public of the possibility of these severe types of floods in this area and the potential to be life threatening.
- The ineffective warning: the warning which did not reach everybody and did not convey clearly the message that a life-threatening event might occur and that people needed to find a safe location.
- The incapacity to rescue oneself of elderly and people with a disability.

Some minor suggestions are provided below to enhance the discussion on the analysis of the factors contributing to the fatality numbers or to enhance the clarity of the paper even further.

Specific comments

Abstract: The abstract is clearly written. It describes the events and demonstrates its extremity, it provides information on where people died and provides recommendations to reduce the probability of such disasters in the future. However, it does not summarize the causes of the high number of fatalities as is promised in the title. This might be added in a summarized form.

Introduction: This shows the exceptional character of the event in number of fatalities. The text in lines 75-80 may be removed. It does not add to the explanation of why the Ahr flood resulted in that many fatalities.

In the text and abstract the flood is sometimes referred to as unprecedented flood, but it is also explained that a similar event occurred in 1804. Perhaps one sentence can be added explaining this: the flood is called unprecedented, but this refers to the recent history. There was a similar flooding in 1804, but then the valley was still completely different and also the village was different and most people are not aware of this past flood anymore.

Section 2: In the text it is repeated three times that data is used from files from the public prosecutor's office in Koblenz. (This is not a big issue, but perhaps it may be repeated less).

Section 3: results and discussion: Add a brief sentence explaining in one sentence why 109 cases are analysed. It is because of 134 there are 25 which are out of the area or without information. Cases refer to fatality incidents.

Add some context in section 3 if possible: The analysis focused of course on the fatality records. To get a complete insight into the occurrence of flood fatalities however, also locations without fatalities should be considered. This may be mentioned without adding such an analysis to this paper. The paper says that in more than 73% of the cases (flood fatalities) water depths exceeded 2m. Is there also info on e.g. how many residences experienced these conditions in total (with and without fatalities). Thus: did you also consider locations without fatalities with similar conditions and looked at how people there survived? Might that add to the understanding of why the other people died? What is the mortality of the event in total? Are the fatalities rare exceptions/incidents or did people at certain very dangerous locations had a seriously higher mortality than at other locations?

Line 174: you mention cellars as dangerous, but you indicate that water depths were above 4 meters so that many fatalities occurred on the ground floor. Do you know if many people died in cellars? If not, perhaps mention that. It is a little confusing now.

Line 239-240 "Men over the age of 70 .. , 2012)"this sentence may be removed. It is not relevant here.

Line 275: This line suggests that the focus of emergency communication was on mitigating economic damage before. This was not explained before. What was the message? Give that more attention in the paper, since that may also be a contributing factor to why that many fatalities occurred.