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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Flood risk related to a fluvial system modified by dams with emphasis on morphodynamic and hydrological aspects" *by* Karina Vanesa Echevarria et al.

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The authors appreciate very much the reviewer comments because they helped to improve the paper, especially in some relevant aspects related to the applied methodology and the maps results. A pdf. (supplementary pdf) is presented with the most important changes made in the paper. The remaining modifications will be presented in the final version (if requested by the editor). The answer to referee # 1 is attached taking into account that you agreed with almost all the observations and suggestions. On the other hand, we answer to his valuable contributions: After the analysis of the reviewer suggestions, we agree that the title, in part, does not reflect the content and

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data presented in the paper. Unfortunately, the reviewer generated expectations not meets by the paper and make suggestions to the work in this regard. As mentioned previously, the hydrological data are scarce and discontinuous and the analysis of the threat was limited to real events, except for the third scenario. On the other hand, more geomorphological data were added to support the considered susceptibility values, added to the topographic data that appear in the submitted paper and that was observed by the referee.

Specific points Although the use of Spanish and gray literature (conferences, thesis) is not recommended, we believe it is important to mention it to show that the works done are very limited in the study area. Therefore, the presented work is a flood risk preliminary assessment in an area where the watersheds are not instrumented, hydrological data are scarce, there is an advance of urbanization on the floodplain and there are institutions interested in order to solve these problems. l.70. In disciplines such as geomorphology and sedimentology the term is used e.g. high and low energy processes, referring to flows of different velocity that generate deposits of different grain sizes. In this context, the term “energy” is used. l.143. The appropriate term is height difference (expressed in m) and not slope (% or degree). The error was not conceptual but translation. l.215 ff. As mentioned, the obtained eyewitness reports from local residents and water-level marks (considering vegetation, sediment distribution, erosion features) were a very important information source on the hydrological events. l. 239. As mentioned in the methodology, the Hazard represents the Susceptibility or natural fragility of a región exposed to a certain Threat. The susceptibility includes the geological, geomorphological, lithological, hydrological, geotechnical aspects, among others, that together determine the behavior of an area in front of a natural process (Panizza, 1992), whereas the Threat, according to Hermelin (1991), is the probability of occurrence of a potentially destructive phenomenon within a specific time period for a specific area. Therefore, the hazard results presented in Table 4 arise from crossing, in this case qualitatively, of the susceptibility class with the threat.

Answer to referee # 1: Of course, it is important to mention that the main advantage of the proposed method is to evaluate, in a qualitative way, the flood risk in a region where the basins are not instrumented and the hydrological data are scarce and discontinuous. Currently, the scientific literature worldwide show numerous examples (Dewan et al., 2007; Fernández and Lutz, 2010; Masood and Takeuchi, 2012; Quiroz Londoño et al., 2013; Sayed and Haruyama, 2016, among others) that use digital elevation models and its derived maps as main inputs for the flood risk mapping added to hydrological models and Geographic Information Systems. However, the free available DEM, often cannot be applied in detail areas (as in the case of our study area) due to their spatial resolution (30 m x 30 m in Argentina). On the other hand, hydrological models that usually are used for the threat evaluation require data series long enough to obtain reliable results. In Argentina, there are few equipped rivers and streams with long and reliable data series that allow estimating extraordinary flood flows and their return period. As a consequence, most of the time, the flow data considered come from instantaneous gauging or estimates (especially in flood events) made from a surveyed cross section (using sedimentological indicators, water-level marks, erosion features) and approaching velocity through the Manning equation. In this context, the proposed methodology allows the preparation of preliminary maps of flood risk, where the estimation of susceptibility is strongly based on topographical and geomorphological aspects whereas the magnitude and threat distribution were based on the information provided by the local inhabitants and that obtained from real flood events. Therefore, they are very useful to develop land use plans in areas with scarce data. In the corrected version, and as suggested by the referee, these aspects are highlighted in the introduction and conclusions sections.

In relation to the specific comments: - After the analysis of the reviewer suggestions, we agree in relation to the paper title. It is broad and does not highlight the particular case study so we decided to modify it. The new proposed title is "Flood risk assessment in an ungauged and damming stream, based on geomorphological aspects. Case study: De Los Sauces river, Córdoba, Argentina". On the other hand, the objective of the

study was also modified: "to evaluate the flood risk of an alluvial floodplain intervened with dams applying a semiquantitative methodology that emphasizes on geomorphological aspects. -The introduction was modified and a detailed state of the art of the scientific literature was added, in order to compare with other works related to flood risk assessment in the mentioned conditions. -As was mentioned previously, the lack of long series of reliable hydrological data limited the threat evaluation to real flood scenarios, except for the third scenario in which the total opening of the dam floodgates is assumed. -The susceptibility matrix was modified and more geomorphological information and land use data were incorporated, which allowed the inactive channel to be divided into different sections within the upper class, which is reflected also in the maps. -The objective of the work is not to develop a guideline for taking into account the risk dynamic, although the suggestion is appreciated.

Other Comments: -For this paper, the mining and solid waste disposal were considered in the susceptibility evaluation and in the threat scenarios. Due to the lack of machinery and installed infrastructure, mining was not considered in the vulnerability analysis. On the other hand, the waste disposal, in this case, is not considered very relevant taking into account the involved volumes. -The colors in Tables 4 and 6 were removed to avoid the reader confusion. -The vulnerability analysis was made taking into consideration the population density and main routes access to the localities. Both were considered especially relevant in this case. Although there are numerous and detailed studies on social vulnerability in the flood risk assessment (Birkmann, 2007; Fekete, 2009; Koks et al., 2015; Ahmed et al., 2019, among others), the objective of this work is not to evaluate social, economic and cultural aspects of the vulnerability but to establish a first vulnerability approximation to estimate the risk. It is not ruled out that in future studies a more detailed vulnerability study could be carried out by social experts. REFERENCES Ahmed T., El-Zein, A., Tonmoy, F.N., Maggi, F.and Chung, K.S.K. Flood Exposure and Social Vulnerability for Prioritizing Local Adaptation of Urban Storm Water Systems. In: Mathew J., Lim C., Ma L., Sands D., Cholette M., Borghesani P. (eds) Asset Intelligence through Integration and Interoperability and

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Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-162/nhess-2018-162-AC2-supplement.pdf

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