

Interactive comment on “Anthropogenic climate change and glacier lake outburst flood risk: local and global drivers and responsibilities for the case of Lake Palcacocha, Peru” by Christian Huggel et al.

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Review

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Based on the prominent case study of Lake Palcacocha in the Peruvian Andes the paper deals with the complexity of “socio-economical, institutional and cultural processes” which become drivers of risk exposure and vulnerability and ultimately shape glacier lake outburst flood risk for the urban agglomeration of Huaraz. Questions of associated responsibilities, causality, and justice in the context of the adverse effects of climate change are also raised. This integration of a “normative responsibility framework” is rather unusual and innovative in scientific studies on GLOFs. It extends the research perspective and integrates dimensions of political ecology and glaciology.

The paper is very well structured and the line of argument is convincing throughout the text. The introduction presents a clear statement of the problem with relevant references. When the authors mention the “impacts of glacier changes on natural and human systems” (l 32) they might also refer to papers on socio-hydrological interactions in other mountain regions in order to strengthen the global perspective. There are a number of contributions from various parts of the Himalaya. Such references would also be useful when the authors refer to adaptation strategies to cope with cryosphere changes (l 40-44). Socio-hydrological case studies dealing with meltwater dependent irrigated agriculture may be useful in this context (e.g. from Ladakh). The authors present their general understanding of this glacier riskscape “as a function of physical hazard, human exposure, and vulnerability of people and assets” (l 60), taking into consideration the IPCC-based framework and classical risk concepts developed by Blaikie, Oliver-Smith, and Wisner. The case of lake Palcacocha is particularly interesting as it is not only a representative case study for cryosphere risks (in the sense of the cryoscape) but it also presents a legal case where different actors are involved, in this case, a local Peruvian citizen and a German energy producer.

The case study of Lake Palcacocha is presented in a detailed and historically informed way. The physical and socio-economic drivers of risk are also presented in a convincing way. Section 4 provides important information on the socio-economic drivers of risk, especially the importance of recent urbanization processes, demographic growth,

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and the role of different actor groups (Quechua-speaking farmers, mine workers, ruling Spanish-speaking classes) together with some remarks on settlement history. It is important to focus on class division, social marginalization and other economic factors to understand decision-making in urban planning and practices of building in hazard-prone regions. The authors might also add some examples from other mountain regions in the Global South to have a wider and more global context (people opt for habitat locations in hazard-prone flood plains because of economic gains). The last few lines of this section (l 299-300) are quite general (global histories of colonial power, neoliberalism, resource extraction). These aspects might be contextualized with social processes in the context of GLOF disasters. Section 5 provides detailed information on weak institutional structures and problems in regional governance over the past decades. The set of culturally embedded explanations of the 1941 GLOF and the important aspect of local concepts of place attachment are contextualized as other dimensions of explanation. The authors conclude that risk and associated loss and damage “is a multi-faceted construction and the question of causality can often not be fully solved, at least not in a quantitative way” (l 485-486). The paper uses a local case study to provide a multi-dimensional analysis with very relevant implications for international climate policy. This is innovative and deserves publication. The figures are relevant and illustrative.

Some few typos need to be corrected, e.g. l 104 two punctuations l 115 Hans Kinzl l 136 delete one bracket

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