Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-403-AC3, 2020

Natural Hazards and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "Review article: Natural hazard risk assessments at the global scale" *by* Philip J. Ward et al.

Philip J. Ward et al.

philip.ward@ivm.vu.nl

Received and published: 20 February 2020

Thank you for the opportunity to review this valuable & timely effort. For myself & my colleagues at the World Bank, this catalogue will be useful to support and employ risk analytics at global scale. For each of the hazards, the overview of the current state of disaster risk modeling is detailed and comprehensive, and the article's structure will make it a handy reference. We would like to thank the reviewer for the time taken to review our manuscript. We are delighted that it will be of value to organisations such as the World Bank, and very pleased that the referee states that the review is detailed and comprehensive. We respond to the specific comments of the review below.

(1) In the discussion of future research challenges & opportunities in section 4, I sug-

Printer-friendly version

Discussion paper

gest that the authors include as a subsection a brief mention of work on socio-economic vulnerability and resilience to disasters, at global level. Although socio-economic characteristics are typically left out of the canonical hazard/exposure/vulnerability heuristic (line 44), state-of-the-art risk analytics are increasingly moving to include them, as described by the authors throughout the text. For example, socio-economic heterogeneities are noted as relevant inputs to drought (lines 316, 344) and wildfire risk (lines 346, 356-8), and would likely also be useful to develop representations of landslides (lines 520-24). Deep interdependencies between these hazards' impacts and socio-economic risk factors may be one reason that modeling of these hazards is still relatively rudimentary, suggesting an opportunity for further research. Similarly, for hazards that have proved more tractable including flooding and earthquakes: the efficacy of DRR measures can depend greatly on socio-economic feedbacks including risk perception (lines 645, 753), social vulnerability (734), and resilience (740). Incorporating these datasets and dynamics will be essential to the development of CBA tools. As risk analytics achieve greater spatial resolution and theoretical sophistication, socioeconomic information layers are increasingly relevant for risk analytics, and essential for DRR applications (even apart from political economy considerations). For these reasons, and to summarize as an opportunity for research the point made throughout the text, I recommend that the authors include a brief note in Section 4. I know that the authors are familiar with this area from their own research, and I suggest as well my colleagues' work on the subject at global scale. Thank you. We agree with the reviewer on the importance of this issue. Some aspects were discussed in section 4.3, but based on the reviewer's comment we propose to further strengthen both section 4.3 (Vulnerability) to include some of the these important social vulnerability aspects as well as section 4.4 (DRR measures). The proposed text to be added to these 2 subsections reads as follows: Section 4.3 additional text: "Specifically, there is an increased recognition of the need to assess how socioeconomic processes can influence spatiotemporal changes in vulnerability (Cutter et al., 2015). For example, there can be a temporary rise in risk perception after a natural hazard, resulting in an increase in

Printer-friendly version

Discussion paper

DRR activities. Conversely, the absence of a natural hazard over a prolonged period can create a (false) sense of safety, which can increase vulnerability (Di Baldassarre et al., 2015). An improved understanding of these dynamics of socio-economic vulnerability can significantly improve the ability of risk managers to more efficiently implement DRR measures (Hallegatte et al., 2017; Wens et al., 2019). Recent studies have attempted to assess some of these aspects, for example by developing indicators of socioeconomic resilience for over 90 countries (Hallegatte et al., 2016), examining spatial differences in risk in different poverty groups (Hallegatte et al., 2015; Winsemius et al., 2018), or modelling dynamic feedbacks between levees and risk perception (Di Baldassarre et al., 2018; Haer et al., 2019). De Ruiter et al. (2020) discuss how the impacts of consecutive disasters can be distinctly different from single hazards due to changes in socioeconomic vulnerability" and "Moreover, international organisations on the ground are calling for an even higher level of granularity of these exposure, vulnerability and risk estimates in order to correctly target those individuals who are in mostly need of disaster relief aid. For this to be achieved, it is not only required to combine estimates of natural hazard with higher-resolution vulnerability and exposure information, but also to increase the level of detail of the latter for different groups, for example with regards to gender, income, livelihood, and access to healthcare." Section 4.4 additional text: "Another aspect that is often overlooked, especially on a global scale, is the interactions between different DRR measures that are aimed at specific hazards (Zaghi et al. 2016; Scolobig et al., 2017). DRR measures aimed at decreasing the risk of one hazard can increase the risk of another, so-called asynergies of DRR measures (De Ruiter et al., 2020). For example, building on stilts is a commonly used measure to decrease a building's flood vulnerability, but it can simultaneously increase a building's earthquake vulnerability (Wood and Good 2004). Accounting for such asynergies between DRR measures in a risk analysis is crucial, for example when developing tools that enable policy makers to assess the effectiveness of DRR measures. A first attempt to quantify these asymmetries at a large spatial scale has recently been carried out by De Ruiter et al. (2020), for measures to reduce flood and earthquake risk. The

expansion of these approaches to global scale would be a large step forward for global risk modelling."

(2) line 297 "is" misspelled as "us" Thank you. This will be amended

(3) lines 792 & 795 replace "between" with "among" Thank you. Both of these typos will be amended as suggested

References cited by the reviewer or in our response to the reviewer âĂć De Ruiter, M.C., Couasnon, A., Van den Homberg, M.J.C., Daniell, J.E., Gill, J.C., Ward, P.J., 2020. Why we can no longer ignore consecutive disasters. Earths Future, online first, doi:10.1029/2019EF001425 âĂć De Ruiter, M.C., De Bruijn, J.A., Englhardt, J., Daniell, J.W., Ward, P.J., De Moel, H., 2020. The asynergies of disaster risk reduction measures: comparing floods and earthquakes. In review. âĂć Di Baldassarre, G., Viglione, A., Carr, G., Kuil, L., Yan, K., Brandimarte, L., Blöschl, G., 2015. Debates-Perspectives on socio-hydrology: Capturing feedbacks between physical and social processes. Water Resour. Res., 51, 4770-4781, doi:10.1002/2014WR016416 âĂć Haer, T., Botzen, W.J.W., Aerts, J.C.J.H., 2019. Advancing disaster policies by integrating dynamic adaptive behaviour in risk assessments using an agent-based modelling approach. Environ. Res. Lett., 14, 044022, doi:10.1088/1748-9326/ab0770 âĂć Hallegatte, S., Green, C., Nicholls, R.J., Corfee-Morlot, J., 2013. Future flood losses in major coastal cities. Nat. Clim. Change, 3, 802-806, doi:10.1038/nclimate1979 âĂć Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., Rozenberg, J., Treguer, D., Vogt-Schilb, A., 2016. Shock Waves: Managing the Impacts of Climate Change on Poverty. World Bank, Washington DC âĂć Hallegatte, S., Vogt-Schilb, A., Bangalore, M., Rozenberg, J., 2017. Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters. Washington DC, World Bank âĂć Scolobig, A., Komendantova, N., Mignan, A., 2017. Mainstreaming multi-risk approaches into policy. Geosciences, 7, 129, doi: 10.3390/geosciences7040129 âĂć Ward, P.J., Jongman, B., Aerts, J.C.J.H., Bates, P.D., Botzen, W.J.W., Diaz Loaiza, A., Hallegatte, S., Kind, J.M., Kwadijk, J., Scussolini, P., Winsemius, H.C., 2017. A global frame-

work for future costs and benefits of river-flood protection in urban areas. Nat. Clim. Chang., 7, 642-646, doi:10.1038/NCLIMATE3350 âĂć Wens, M., Johnson, J.M., Zagaria, C., Veldkamp, T.I.E., 2019. Integrating human behavior dynamics into drought risk assessmentâĂŤA sociohydrologic, agentâĂŘbased approach. WIREs Water, 6, e1345, doi:10.1002/wat2.1345 âĂć Winsemius, H.C., Jongman, B., Veldkamp, T.I.E., Hallegatte, S., Bangalore, M., Ward, P.J., 2018. Disaster Risk, Climate Change, and Poverty: Assessing the Global Exposure of Poor People to Floods and Droughts. Environ. Dev. Econ., 23, 328-348, doi:10.1017/S1355770X17000444 âĂć Wood, N.J, Good, J.W., 2004. Vulnerability of port and harbor communities to earthquake and tsunami hazards: the use of GIS in community hazard planning. Coast. Manage., 32, 243-269, doi:10.1080/08920750490448622 âĂć Zaghi, A.E., Padgett, J.E., Bruneau, M., Barbato, M., 2016. Establishing common nomenclature, characterizing the problem, and identifying future opportunities in multihazard design. J. Struct. Eng., 142, H2516001, doi:10.1061/(ASCE)ST.1943-541X.0001586

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2019-403, 2019.

Printer-friendly version

Discussion paper