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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "From Tsunami Risk Assessment to Disaster Risk Reduction. The case of Oman" *by* Ignacio Aguirre Ayerbe et al.

Anonymous Referee #1

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Main comments - How can you evaluate that your goal was succeed for tsunami DRR even if there is no actual tsunami event to test? Of course, I agreed if your goal is to develop some tools or frameworks for DRR and to say that the country will be more prepared. Otherwise, please give some examples (may be in other countries?) to support that in what way, what you have achieved in this project can reduce tsunami risk in the future. - Risk communication is also very important. Good quality of DRR countermeasures will be meaningless if they were failed in transferring to people at risk. Also, I could see that you mentioned about education, but I think it should be explained more on how the people at risk will be properly/correctly educated and have high capacity enough to receive risk information from the government, etc.

Specific comments Title: I feel that the title is rather general and should be modified to

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Discussion paper

be more attractive Abstract: I feel that the main results of your study did not appear in the abstract. I would also write about the recommended countermeasures, recommendation for DRR in Oman here. Introduction: - You may split this part into three sections, 1) tsunami hazards in Oman, 2) risk assessment method and 3) your study objectives - These are other studies on tsunamis in MSZ and should be properly credited. I remember that one of them also use high resolution of bathymetry in Oman. Heidarzadeh M, Kijko A (2011) A probabilistic tsunami hazard assessment for the Makran subduction zone at the northwestern Indian Ocean. Nat Hazards 56:577–593 Heidarzadeh M, Satake K (2014a) New insights into the source of the Makran tsunami of 27 November 1945 from tsunami waveforms and coastal deformation data. Pure Appl Geophys 172(3):621–640 Heidarzadeh M, Satake K (2014b) Possible sources of the tsunami observed in the northwestern Indian Ocean following the 2013 September 24 Mw 7.7 Pakistan inland earthquake. Geophys J Int 199(2):752–766 Heidarzadeh M, Pirooz MD, Zaker NH, Synolakis CE (2008a) Evaluating tsunami hazard in the Northwestern Indian Ocean. Pure appl Geophys 165:2045–2058 Heidarzadeh M, Pirooz MD, Zaker NH, Yalciner AC, Mokhtari M, Esmaeily A (2008b) Historical tsunami in the Makran Subduction Zone off the southern coasts of Iran and Pakistan and results of numerical modeling. Ocean Eng 165:2045–2058 Heidarzadeh M, Pirooz MD, Zaker NH (2009) Modeling the near-field effects of the worst-case tsunami in the Makran subduction zone. Ocean Eng 36(5):368–376 Latcharote, P., Al-Salem, K., Suppasri, A., Pokavanich, T., Toda, S., Jayaramu, Y., Al-Enezi, A., Al-Ragumand, A. and Imamura, F. (2017) Tsunami hazard evaluation for Kuwait and Arabian Gulf due to Makran Subduction Zone and Subaerial landslides, Natural Hazards - Page 2 lines 40-43: This way of citing is not so good. Because you are mentioning three different risk targets (building, infrastructure and human), readers will not know that which reference did what. - There are recent studies on the vulnerability of the mentioned risk targets (in addition to building). Suppasri, A., Fukui, K., Yamashita, K., Leelawat, N., Ohira, H., and Imamura, F.: Developing fragility functions for aquaculture rafts and eelgrass in the case of the 2011 Great East Japan tsunami, Nat. Hazards Earth Syst. Sci.,

18, 145-155 Shoji, G. and Nakamura, T.: Damage assessment of road bridges subjected to the 2011 Tohoku Pacific earthquake tsunami, Journal of Disaster Research, 12, 79–89, 2017. Suppasri, A., Latcharote, P., Bricker, J. D., Leelawat, N., Hayashi, A., Yamashita, K., Makinoshima, F., Roeber, V. and Imamura, F. (2016) Improvement of tsunami countermeasures based on lessons from the 2011 great east japan earthquake and tsunami -Situation after five years-, Coastal Engineering Journal, 58 (4), 1640011. Suppasri, A., Muhari, A., Futami, T., Imamura, F. and Shuto, N. (2014) Loss functions of small marine vessels based on surveyed data and numerical simulation of the 2011 Great East Japan tsunami, Journal of Waterway, Port, Coastal and Ocean Engineering-ASCE, 140 (5), 04014018. Methodology - You may write section name 2.1, 2.2., 2.3... in Fig. 1. 2.1: Please give a reference that other source of tsunamis such as landslide or volcanic eruption can be neglected. - Page 5 line 129: "Okada model" should be properly cited giving the year and put in the reference - Please also tell readers about your computational grid size. Although the simulation was done by your previous study but the grid size is important to understand the resolution of your study. - Please give some comments if the tsunami sources in your study the same or different to other previous studies. - Page 5 line 145: "drag level" sounds wired to me. I would prefer "drag force" or "hydrodynamic force". Please check and consider. 2.2: I feel that you just mentioned about your risk variables but not on how the hazard and risk will be linked. Few sentences in lines 146-150 is probably rather fit to this section as they explain the linkage between hazard and vulnerability. However, another question about these references is how can you directly applied their proposed vulnerability functions to Oman. For example, building strength in Oman may different to other countries. - Table 1: I think age and gender are also important as they are directly related to the evacuation speed. Did you used different kinds of vulnerability functions for different kinds of buildings/infrastructures? 2.3 Fig. 4: I can see that you used flow depth and drag force as your hazard index. What if both give different results? Low flow depth with high velocity will have high drag force, therefore, you will have lower hazard level when using flow depth but higher hazard level when using drag

force. - What is the meaning of “assigned score”, how it is assigned and how it was applied to different human and infrastructure index? - There should be some explanations about the hazard-vulnerability table, not just only shown in Fig. 4. 2.4: What is RRM? - Fig. 5: “exposure assessment” have never mentioned before or in any places in your paper but shown in this figure. Please explain in your main text. - In Fig. 2 you show disaster cycle, but you only focused on prevention and preparation in your study. How emergency response and recovery included in your study or will be considered in the future? - I can see only section 2.4.1 but no 2.4.2. - Page 10 line 278: How the recommended measures were determined? In what way they were decided that priority to be recommend? Were they determined by hazard reduction performance, economic cost, B/C, impact to environment, etc? Results: Fig. 9: How can local people get an access to information like in Fig. 9? - 3.3 Page 18 Lines 395-396: How the knowledge can be transferred? Any example? - Page 18 Line 405: How can you make sure that it will not be just a manual which people will never read? How this manual will be used for various practical actions such as evacuation drills, etc? Page 18 Line 411: In what way the warning message can be disseminated to local people or how they can access? Conclusions: I suggest reorganizing like this 1) the new method used in this study, 2) recommendations to government or local people in Oman and 3) Global applications/limitations of this study - The Sendai Framework have never appeared in the main text but suddenly mentioned here. If you want to keep this sentence, please also mention in your introduction or methodology on the linkage between your work and the Sendai Framework.

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