RC 3

Reviewer comments	Author response
DSHA and PSHA: Usually the hazard level determined by DSHA should be higher than or equal to that by PSHA since DSHA considers characteristic events regardless it occurrence probability. Thus, I am surprised that the DSHA results (Figures 8 and 9) has significant lower hazard than the PSHA ones (Figure 12 b). I am confused how it could happen. I wish authors could have a good explanation for it.	The reason for the hazard map based on DSHA has lower values compared to that from PSHA is that DSHA was modelled based on point sources from historical events while PSHA was modelled using line and areal sources. Hence, while some points in DSHA as tabulated in Table 3 and Figure 8 may occur at a large magnitude within similar zones to those in PSHA, these events are located further from the site when compared to the areal and line models in PSHA in Figure 4.
Catalogue completeness: Implementing an incomplete catalogue could result in overestimation of earthquake recurrence for large magnitude. In this study, earthquakes with M≥4.0 since 1907 (or 1976, stated in Line 15 of Page 10) are implemented. However, the catalogue incompleteness is shown in Figure 5b that seismicity with M≤4.2 does not follow the G-R law, resulting in a lower-b-value (shown in Table 3, since it is uncommon having b-value smaller that 0.8, especially in active tectonic environments). A G-R model with a low b-value expect higher occurrence rate for large magnitude and higher hazard.	The use of the entire magnitude range (4.0 – 9.1) was initially considered based on the observation that earthquakes causing felt ground motion in the peninsula start at M_w 4.0. We, therefore, assumed that the catalog is complete. However, taking into account that both Reviewer #2 and Reviewer #3 have noted that the completeness analysis is essential for the PSHA, we have already performed a completeness analyses using the Stepp (1972) method and the results will be included in the revised manuscript. Although it is quite uncommon for b-value to be smaller than 0.8, previous literature (Petersen et al. 2007, Pailoplee and Choonwong 2014, and Pailoplee 2017) showed that the b-value in this region can be relatively low in some cases. With our new completeness analysis results we will report revised b-values (together with their standard deviation) in Table 3 in the revised manuscript.
Fault parameters: The fault parameters (e.g., segmentation, maximum magnitude, slip rate) implemented in this study are obtained from previous researches. These parameters, however, sometimes are different from the Indonesian Hazard Map (the 2010 version can be download through:, updated version has been proposed in 2017). For example, the slip rate of the Sumatran Fault implemented in this study (Lines 19-23 of Page 5) is significant higher than those proposed by the Indonesian Hazard Map; segmentation of the Sumatran fault is different. If authors prefer the current setting, some description on the discrepancy between each other is required.	We have explained the reason for why we prefer the segmentation suggested by Burton & Hall (2014) compared to Natawidjaja & Triyoso (2007) in page 10, lines 8 – 15 of the original manuscript. As for the slip rates, these values were not provided by Burton & Hall (2014). We have, therefore, extracted the slip rate values from Natawidjaja & Triyoso (2007). For example, Zone 1 in Burton & Hall (2014) is approximately the same as Seulimium fault in Natawidjaja & Triyoso (2007). Hence, the slip rate of 13mm/year reported in Natawidjaja & Triyoso (2007) was adopted and input into the zonation suggested by Burton and Hall (2014).

	We will give a brief explanation of the values in the revised manuscript.
Logic tree branch: Since occurrences of earthquakes with different magnitudes are independent to each other, it is not necessary to be implemented into logic tree (as described in Line 32 of Page 12 and Line 1 of Page 13).	Taking into consideration the mistake made in conducting the PSHA as pointed out by Reviewer #2, we have amended our logic tree. We have redone the PSHA using line and areal sources for both the Sumatran subduction and Sumatran fault. The revised logic tree structure will be included in the revised manuscript.
Point source for DSHA: An earthquake could be regarded as a point source when its magnitude is related small, whereas a line or plan source should be implemented for a large event. Experience (in the form of scaling law) suggests fault length could be longer than 10 km for an M≥6.0 event. Besides, for DSHA of the Bukit Tinggi Fault, the epicenter of a coming event is controversial. Thus, I would suggest conducting a series of scenario considering different rupture lines along the fault and report the highest shaking level for each calculation node (, suggesting the worst case).	We thank the Reviewer for the suggestion and appreciate his/her expertise on this. However, literature has shown that point sources have been conducted at relatively high magnitudes. For example, Kolathayar et al. (2012), and Orozova and Suhadolc (1999) have performed their DSHA using point sources at higher magnitude. Although the Reviewer could be right in terms of better representation using line or areal sources, our intention was to conduct the DSHA based on the location of past historical events scaled to an upper boundary magnitude limitation. For the point source at the Bukit Tinggi event, the epicenter was modelled at the current point based on the data provided by the Malaysian Meteorological Department (MMD). Although a series of mini-earthquakes did occur close to the point of reference (3.36°N, 101.75°E), the event at (3.36°N, 101.75°E) was the largest. That is the reason why we have chosen this particular point as our point source. As we cannot pinpoint the exact location of the next earthquake along this source, our intention was to perform a critical scenario with a reasonably high magnitude that has been scaled up based on past events.
Some of the references in the references list cannot be found through the internet (e.g., Loi et al., 2016; Loi et al., submitted). It makes audience difficult to evaluate the credibility of this study. Thus, I would suggest detailed description of the referred studies in the text (e.g., credibility of implemented GMPEs).	Condensed information regarding the GMPEs together with their respective standard deviations (the subject matter of a manuscript currently under consideration by another journal) will be provided in the form of a table in the revised manuscript. We are also happy to provide the unpublished manuscript for a perusal by the Reviewers of this journal.
I feel this study tries to link with design code, thus I would suggest to assess seismic hazard not only in peak ground acceleration, but also spectral acceleration.	Some of the GMPEs (SSZL18, SFZL18 and SM00) utilized in this work do not include the coefficients required to calculate the response spectra. Hence, we have omitted them from the

	current work. Clearly, this is a limitation of the present work as also noted in the manuscript. Our work focused on the PGA at bedrock because as recently as 2016, the Department of Standards Malaysia have drafted a seismic resistance design code based on the Eurocode 8 which specifies the notional design of PGA at bedrock.
Line 4 of Page 4: 'activity' instead of 'recurrence'?	Thank you. We will rectify this in revised manuscript.
Line 8 of Page 4 and Figure 1: Coordinates are expected in Figure 1 so audience can understand the region described in the text.	We will include coordinates in the revised manuscript.
Lines 29-30 of Page 5: A locking depth of 15 km is implemented, while the Indonesian Hazard Map utilized 20 km. Although I do not expect significant difference in the results, I am looking forward to an explanation or a reference for this parameter.	We have not calculated this value, but extracted from Natawidjaja & Triyoso (2007) as mentioned in page 5 line 30-31.
Line 31 of Page 5: An unnecessary comma should be removed.	We will correct this in the revised manuscript.
Line 32 of Page 6: Site class E is soft soil, whereas Vs30 ranging from 760 to 1500ms-1 is defined as site A.	It was a typographical error, and we thank the Reviewer for pointing it out. Site E should be Vs30 of less than 180ms-1. We will correct this in the revised manuscript.
Line 25 of Page 13: 'times' instead of 'fold'?	We will correct this in the revised manuscript.
Lines 12 and 18 of Page 14 and Figure 8: Location of KL should be denoted in Figure 8.	We will denote location of KL in the revised manuscript.
Figure 1: Do orange lines denote active faults? If so, please specify their reference(s). Besides, I am confused on the alignments of 'Tectonic plate boundary'. For the West of Sumatra as example, I expect the boundary should be further to the west (fit the alignment of the Sunda Trench).	Figure 1 will be modified accordingly. However, for the alignments and fault lines, the base source was obtained from ArcGIS Desktop Esri (2015), and has been referenced in Figure 1.
Figure 2: What is the meaning of '>2000 km' in the figure? Thickness of Mantle, or the depth of the boundary between crust and mantle? Besides, there is a typo for 'Mantle'.	Thickness of mantle. Will correct this in the revised manuscript.
Figure 3: Some events took place at the West of the Sunda Trench should not belong to the Sumatran subduction zone.	Although tectonically they may not belong to the SSZ, we have considered them as part of SSZ because these events were large enough to cause ground motion felt in Peninsular Malaysia. Thus, instead of modelling them altogether as a different model/region, we have considered and modelled them under SSZ.
Table 3: Although the epicenter of the 2004 M9.1 event is in Zone 2, part of its rupture zone locates	We appreciate the Reviewer's suggestion. The revised PSHA has already considered this and the results will included in the revised paper.

on Zone 1. Thus I suggest MwMax of 9.1 (or even 9.2) for Zone 1.	
Thus, I suggest this manuscript can be published after a major revision.	We thank the Reviewer for the valuable comments that has improved our paper. We appreciate the Reviewer's recommendation for publication after we have satisfactorily answered the queries and concerns.

References

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