Response to Anonymous Referee #2

In this document, the underlined part is those revision we made for a new manuscript.

Question 1 (Q1): By considering landslide triggering factors, this work is more like a qualitative hazard mapping rather than a susceptibility mapping (van Westen, et al., 2008; Nadim et al., 2008; Fell et al., 2008). van Westen, C. J., et al. (2008). "Spatial data for landslide susceptibility, hazard, and vulnerability assessment: An overview." Engineering Geology 102(3-4): 112-131. Nadim, F., et al. (2006). "Global landslide and avalanche hotspots." Landslides 3(2): 159-173. Fell, R., et al. (2008). "Guidelines for landslide susceptibility, hazard and risk zoning for land use planning." Engineering Geology 102(3–4): 85-98.

Response 1 (R1): Thank you for your comment. In the paper of van Westen et al. (2008), hazard assessment should include temporal and spatial probability of initiation, magnitude–frequency relation and run out potential. Because we did not study the temporal aspect of landslides, we hence did not put qualitative hazard mapping in the title. However, as we put some triggering factors in models, we tend to agree with your comment. The title of this study is corrected to Landslide hazard mapping on global scale using method of logistic regression and related revisions have been made in the new manuscript.

Q2: The slope gradient factor should be added, which is as important as relative relief. Because, it is a common sense that steeper slopes are easier to have landslides than gentler ones.

R2: Thank you for your comment. We agree that slope is very important factor in the research of landslide susceptibility. We have included this factor when building landslide model. But the result show that it is not statistically significant. Therefore we did not include it in this paper. We have analysed the reason. At a global scale, factors such as elevation and slope gradient can be replaced by topographic index or relative relief, which indicate macroscopic differences in topography. Especially for landslide data with low location precision, using factors such as elevation or slope gradient that precisely relate to landslide location will reduce the accuracy of landslide susceptibility analysis. This part has been added in the new manuscript.

Q3: In addition, land cover is also an important influencing factor on landslide susceptibility mapping. It is well acknowledged that vegetation, especially trees can prevent some shallow landslides. The authors are suggested to consider land cover types in their mapping.

R3: Thank you for your comment. Like the factor of slope, we included the factor of land cover when performing experiments. The land cover product with spatial resolution of 30m, GlobeLand30[1], is produced by scientists in China and submitted to United Nations for public use[2]. We tried this factor but found that it is not statistically significant and does not improve the model accuracy. Hence the factor of land cover is not included in this paper. The reason can be that comparing with other factors, land cover may not be a significantly important factor in assessing landslide susceptibility in global scale.

Q4: The authors used two datasets for dependent variable. Is there any consistency between them? Or, can you simply use them by combining both data sets? For example, maybe the Chinese datasets has more landslides within China while underestimate landslides abroad. Also, please introduce this new dataset in more detail, as there seems to be rare reports of it before.

R4: Thank you for your comment. The landslide data in this research comes from BNU World Geological Hazard Inventory and NASA global landslide inventory. In the former manuscript, we did not provide adequate information about it. We have added more in this manuscript:

(1)The sources of related databases. The entries of World Geological Hazard Inventory mainly come from news reports (e.g. mass media in China, Xinhua News, and Sina News) and records in books and journals. We searched information about landslide on Internet by using keywords like landslide and debris flow. Then we read these descriptions carefully to determine whether it is a landslide and locate it, and later put it into the database. Thus the main source of World Geological Hazard Inventory can be news data. By investigating these news, we can find out those landslides that are of large volume or of high danger, for these kinds of landslides can be of high news value.

The NASA global landslide inventory mainly collects landslides from several existing databases, including International Consortium on Landslides website (ICL); International Landslide Centre, University of Durham (ILC); The EM-DAT International Disaster Database; International Federation of Red Cross and Red Crescent Societies field reports; Reliefweb; humanitarian disaster information run by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA); other online regional and national newspaper articles and media sources.

[1] http://www.globeland30.org/GLC30Download/index.aspx

[2] https://unstats.un.org/unsd/GlobeLand30.htm

The best resolution of World Geological Hazard Inventory is 0.001 degree, and the NASA global landslide inventory 2km.

(2) The time period of landslide database. In the World Geological Hazard Inventory, the earliest event can be dated to 1618. In this database, there is 117 landslides occurred before 1975, 84 between 1975 to 2000, and 274 between 2000 and 2014. The landslide events in the NASA global landslide inventory mainly happened in 2003, 2007, 2008 and 2009. Hence these two databases are complementary and they can be emerged to produce a more complete landslide database. This part has been added in the new manuscript.

(3) The combination of two databases. When combining these two databases, the occurrence of time provides crucial standard. When two landslide events have different time (month), they are both reserved in the new database. If two events have the same occurrence time (month) and their locations are close, investigation through details in source could determine whether they are from the same disaster. If yes, the record with higher spatial resolution is reserved and the one with lower resolution is dropped. This part has been added in the new manuscript.

Q5: An improved discussion is needed to compare and highlight the contribution of this work in global landslide mapping compared to previous works.

R5: Thank you for your comment. We have added relevant comparison as follows.

The global landslide susceptibility map may be evaluated by comparison with four studies from the current literature that focus on large-scale landslide susceptibility.

Comparing the European landslide susceptibility map drawn by Van Den Eeckhaut et al. (2012)[3] with the European part of susceptibility map in this study (Fig. 5 (a)), similar areas of high landslide susceptibility can be observed. The former map includes two levels (denoted High and Very High) as high susceptibility with a landslide probability of over 0.8, and this study also includes two levels (Levels 4 and 5) as high susceptibility with a probability over 0.7. The two maps have similar high susceptibility areas. Thus, for Europe, landslide susceptibility map in this study agrees with existing related study.

[3] Van Den Eeckhaut, M., Hervás, J., Jaedicke, C., Malet, J. P., Montanarella, L., & Nadim, F. (2012). Statistical modelling of Europe-wide landslide susceptibility using limited landslide inventory data. Landslides, 9(3), 357-369.

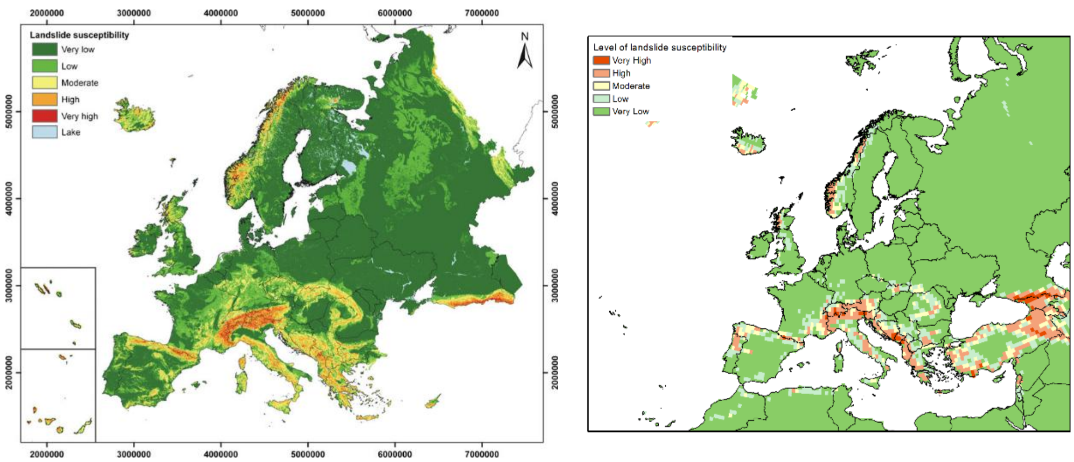

Fig. 5 (a) Comparison of European landslide susceptibility map (from Van Den Eeckhaut et al. 2012) with the related part in this study's map

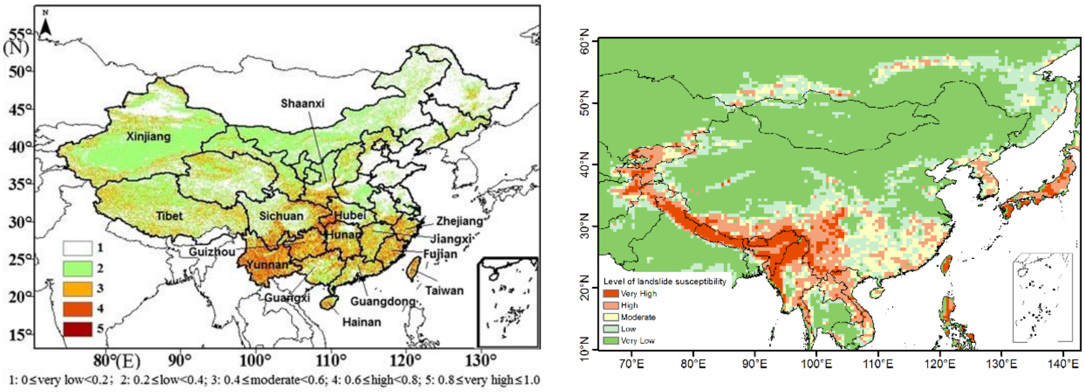

Fig. 5 (b) Comparison of China landslide susceptibility map (from Liu et al. 2013) with the related part in this study's map

Comparing the Chinese landslide susceptibility map drawn by Liu et al. (2013)[4] with the China part of susceptibility map in this study (Fig. 5 (b)), the former map includes two levels (Levels 4 and 5) as susceptible with a landslide probability of over 0.6. Map in this study includes three levels (denoted Levels 3, 4 and 5) as susceptible with landslide probability of over 0.6. The main differences between the two maps are in the western Sichuan Basin and southern Tibet, which is famous for its high elevation and intense relative relief. This study applies many landslide cases in these areas. However, in the landslide database of Liu et al. (2013), only a few landslides occur in these areas. This discrepancy is the reason for the differences between the two maps.

As for landslide susceptibility at global scale, Nadim et al. (2006) and Hong et al. (2007) have ever made magnificent efforts on such topic. One global landslide susceptibility map (please refer to Fig. 7 in Nadim et al. (2006)) has five levels (Levels 5, 6, 7, 8 and 9) as susceptible, while the map from this study includes three levels (Levels 3, 4 and

4 Liu, C., Li, W., Wu, H., Lu, P., Sang, K., Sun, W., & Li, R. (2013). Susceptibility evaluation and mapping of China's landslides based on multi-source data. Natural hazards, 69(3), 1477-1495.

5) as susceptible. In general, the susceptible areas of these two maps are fairly similar except in Madagascar and the eastern Indo-China Peninsula.

Another global landslide susceptibility map (please refer to Fig. 3(a) in Hong et al. (2007)) has two levels (Levels 4 and 5) as susceptible, compared to map in this study, which has three levels (Levels 3, 4 and 5) as susceptible. These two maps are similar over Asia, Europe and Africa. However, map from Hong et al. (2007) has more details over the Americas, for example, showing landslide susceptible areas in the Appalachian Mountains in North America and in the Brazilian Highlands in South America. To a large extent, this greater detail occurs because Hong et al. (2007) used landslide susceptibility map of the United States to adjust the combination weights of explanatory factors in their global model. It is noted that map of Hong et al. (2007) also differs from map of this study in that it shows high landslide susceptibility in central and southern India, and low landslide susceptibility in equatorial islands such as Malaysia, Indonesia, and the Philippines.