This is an interesting paper on landslide susceptibility mapping in Central Asia. I really enjoyed reading this paper, given the challenge of mapping landslide susceptibility over such a large area, and was interested in how the authors dealt with their very complex (heterogeneous) and large data sets. Also, the random forest method seems to be well suited for such an approach on a very large scale. The paper is proposed by an internationally recognized research team with strong experience in landslides. I found it well written and easy to understand. It is an original paper within the scope of the journal that brings novelty to a regional case study. Even if the methods and approach are not specifically new, the application on such a large scale is challenging and worth mentioning.

I recommend it to be accepted with some revisions.

Dear reviewer, thank you very much for your constructive comments and useful suggestions, we modified the paper accordingly. We believe that the quality of our paper has now improved.

1. Major comments

I am not really convinced by the part that consists in analyzing the spatial correspondence between the landslide susceptibility and the elements at risk. To me this part is not really “in the line” with the rest of the article which already brings interesting (and sufficient) technical elements on the process used to map landslide susceptibility all results and discussions that follows. I don’t fundamentally disagree with the approach, and several authors in quite recent research projects showed that at large scale, the risk analysis can not clearly include the temporal dimension (when and how frequently). Then, risk maps are often only the combination of susceptibility and elements at risk. See for example the handbooks of the CHARIM project by van Westen et al. https://www.cdema.org/virtuallibrary/index.php/charim-hbook/methodology/4-landslide-hazards/4-3-landslide-susceptibility-at-the-national-scale

Nevertheless, I think the message of the article would be clearer without this risk part (or maybe just evoked as a prospect or ongoing work in the discussion). Otherwise, the title of the paper should be changed to "Comprehensive landslide susceptibility map and risk assessment of central Asia" (or something similar) and the description of the results should be developed a bit more. This is the reason why I considered a major revision for this paper.

We discussed this issue with the other authors and we decide to remove the section regarding the exposed elements

2. Specific Comments

2.1. Landslide data harmonization

The part dealing with landslide inventory harmonization is interesting (end of section 3.4, lines 343 to 356). To me, it may require a specific subsection that could be called "Landslide Inventory Harmonization" (or some similar idea) to focus specifically on this point, which to me is critical in this research. Perhaps an additional figure (methodological sketch) on this specific point (i.e. buffer zones/omitted training no landslides vs. polygon mapped landslides etc.) will help to highlight this part of the process.

Also in this section, I couldn't find any information on how the polygon mapped landslides were integrated into the RF training. Are these landslides mapped with separate polygons for triggering and runout areas? Traditionally, landslide susceptibility maps are made based on the triggering area only, with the runout or accumulation zone generally considered to be affected, but not strictly "causing" the landslide. At this scale

it may be less important, but still, can you please add this information and discuss it if you feel it is appropriate.

Apparently, the authors used all possible “points” or pixels falling into a landslide/triggering area (or used a buffer approach for point features) to train the RF model. Using statistically based methods (which I personally know better that RF), we generally use only one “point” per landslide considering each landslide as an event. This consideration is also recommended to avoid to artificially increase the weight or influence of large landslides in the calculation. However, I don't know how sensitive RF is to this issue.

Dear reviewer, thanks for your observations. Since the landslide inventory was made both of polygons and points, it was not possible to divide each landslide into source, track, and deposition zone. The exact position of points on landslides was not known as well, we have been referred by the project partners that points represent the centre of the landslide area, but without any data about the approximation level. Because of the paucity of landslide data (with respect to the extension of the study area), we considered all the pixels inside the polygons and a 100 m buffer around the landslide points (please refer to section 3.5 row 374 “all the points within a landslide”). As we wrote in the manuscript, we removed overlapping landslides, to avoid over estimation and weighting of certain areas.

We selected RF model because it is not very susceptible to overfitting issue, since it considers each pixel independently (the relative position and distance between pixels is not considered, since we did not give any info to the model about this), so the dimension of the landslides does not apply any weight to the variables.

We modified the structure of the manuscript adding sections 3.4.1, 3.4.2 and 3.4.3 and we added a flow diagram of the procedure.

2.2. Explanatory factors

In general, rainfall data are not used for susceptibility analysis, since it is more a matter of triggering and thus hazard. However, several large papers have used it anyway, as it could be considered a preparatory factor under some conditions (and it is actually mentioned in your landslide description section). I think you could add a sentence or two to justify more precisely why and how you decided to include it (e.g. around line 300).

Thanks for the suggestions. We added more text in section 3.3.

2.3. Results section

Could you please justify the close-up view of the selected study area? I can easily understand this, but a transition sentence would be welcome.

The close-ups have been used to better show the result of the analyses, since it is almost impossible to appreciate the details with a global view of the study area. We added a sentence after table 2. Fergana valley close-up was added since it is a very relevant area, according to the local partners, which is worth of a dedicated sub-section.

2.4. Landslide data presentation

Even though the different landslide inventories are well presented in the different paragraphs of section 3.1, I think a summary table mentioning references, area, number of mapped landslides, scale, data format (i.e. point, polygon or other) etc. would be a nice summary for the readers.

We have added a new Table 2.

2.5. ROC curves

I didn't understand if the ROC curves in Figure 14 were done for training samples or validation or both? In general, we show calibration ROC curves (from training samples) and validation ROC curves (from independent sample). Could you please clarify this?

The ROC curves reported in fig. 14 represent the validation dataset; we modified the caption of the figure for more clarity

3. Technical corrections

Thanks for the comments, we modified the text and the figures accordingly. Fig. 11 was also improved, while the conclusions were rewritten. Minor errors were corrected thorough tough the manuscript.

Line 158 : a dot is missing at the end of the sentence

Line 422 : capital letter missing

Line 564 : “they” instead of “the” (I guess)

Line 580 : “at” Instead of “al”

Line 580 : “router?” I’m not sure this is right. “Route?” “Road?”

Fig 5 title “map of the adopted landslide inventory”

Fig 5. This figure is zoomed to a specific region that is difficult to locate within the entire study area. You may add the countries names to help reading it.