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Subject: Manuscript revision

Dear Editor,

First of all, we are very thankful for your constructive comments on our study. Specially, we are heartily grateful to your valuable suggestions.

The manuscript has been revised carefully and strictly according to your letter. We are submitting our revised version entitled "Application of the LM-BP neural network approach for landslide risk assessments", Manuscript ID nhess-2018-360.

Please find the revised manuscript with track changes. In order to facilitate your review, bold fonts were used to show revision and changes. In the following "Point-to-point response to the editor's letter and the reviewers' comments".

Please do not hesitate to contact me, if further material or information is needed.

Note: All major changes are red-marked in the revised manuscript.

Thanks again.

Sincerely yours,

Junnan Xiong

Detailed responses to the comments are addressed below.

Comments to the Author:

I have read with interest your manuscript and I'm pleased to see the effort you have taken to include earlier comments. However, I think the manuscript can improve when you consider the below comments.

- Reword running title to be more specific. For example reword to 'Landslide risk zonation for areas containing hydrocarbon transport pipelines'.

Thank you for your comments. We have reworded the running title.

Running Title: Landslide risk zonation for areas containing Products oil transport pipelines

- Line 35&36. Change the word 'mileage' to 'length'. Mileage has implicitly the meaning of a none SI unit 'mile'.

Yes, done

- Line 119 – 121. 'The irrational unit'. Explain what 'the irrational unit' is.

Thank you, we have added the explanation.

Line 122:

The irrational unit (slope unit with inaccurate boundary) was artificially identified and modified by comparing GF-1 satellite remote sensing images. Boundary correction, fragment combination and fissure filling were used for modification.

- Line 122. Reword 'The object of the pipeline vulnerability assessment in the landslide area was the pipeline' to something like: 'This study focusses on assessing the vulnerability of transport pipelines to landslides'.

Done

- Line 131. Remove '...of the paper...'

Done

- Line 147-148. Replace 'The neural network, an and an output layer.' with 'A neural network is a nonlinear mathematical structure which is capable of representing complex nonlinear processes that relate the inputs and outputs of any system (Hsu et al., 1995).'

Yes, done

- Line 151-152. Replace '...and is good at dealing with a lot of uncertainty information.' With '...and can incorporate well uncertainty information.'

Done

- Line 155-157. Reword the sentence 'This method can be ... these fuzzy information.' I'm unsure what you try to say here.

We thank you for your comments, and the sentence have been reword.

Line: 159-161

The information about landslide reflected by the data used in the process of susceptibility assessment is mostly qualitative rather than quantitative. Through the analysis of these fuzzy information, accurate assessment results can be obtained.

• Line 183-184. Double check your interval and reword such that it reads something like: 'Besides, the susceptibility degree in the area was monotone decreasing in the slope interval of 60 to 90 degrees.' So do you mean the slope interval of 60 to 90 degrees?

Yes, done. It means the slope interval of 60 to 90 degrees

• Line 184. Change '...in a slope at ...' To '...in slopes at...'

Done

• Line 190-193. Reword 'Each 200 is... by traditional methods.' It is unclear what you mean here.

Thank you, we have rewritten the sentence.

Line 193-199:

When establishing the empty matrix, the sample size of each landslide susceptibility level was set to 200, and the training sample size was 800. According to the order of susceptibility from low to high (Appendix 1), the input was constructed by interpolating in each interval. The interval of the susceptibility degree was [0, 1], and the output was obtained by interpolating 800 values equidistantly between the interval of [0, 1] (Appendix 2). Using interpolation theory to build samples avoided the excess human influence in the process of building neural network model by traditional methods.

- Line 204. Reword ‘...indicator, and the more difference of the data, the...’ to something like ‘...indicator, the more difference the data, the...’.

Done

- Line 258. Reword ‘...and make the micro results macro.’ To something like ‘...and accelerate findings’.

Done

- Line 261. Remove ‘degrees’ such that it reads: ‘The susceptibility and vulnerability degrees were distinguished’.

Yes, done

- Line 332. Remove ‘with’ such that it reads: ‘...and planners a comprehensive...’.

Yes, done

- Line 333. Change such that it reads: ‘...of landslide risk in areas containing pipelines.’.

Done

- Line 334. Remove ‘... or even pipelines in an area..... by landslides.’ Such that it reads: ‘... of failure of slopes.’

Done

- Line 340. Reword such that it reads: ‘...of different methods and recommend one or more optimal approaches.’.

Done

- Line 342-345. Reword to something like: ‘This study shows that landslide risk assessments can be performed with minimal amount of relatively easy to obtain datasets. We advocate to establish a database with assessment parameters similar as described by this study to construct dynamic landslide risk assessment models.’

Yes, done