

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1  
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## **Comment on nhess-2021-294**

Anonymous Referee #1

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Referee comment on "Strategic framework for natural disaster risk mitigation using deep learning and cost-benefit analysis" by Ji-Myong Kim et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-294-RC1>, 2021

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Sunday, November 21<sup>st</sup>, 2021

Ref.: NHESS 2021\_294 titled: "A Strategic Framework for Natural Disaster-Induced Cost Risk Analysis and Mitigation: A Two-Stage Approach Using Deep Learning and Cost-Benefit Analysis"

Dear authors,

I read with interest your manuscript titled: " A Strategic Framework for Natural Disaster-Induced Cost Risk Analysis and Mitigation: A Two-Stage Approach Using Deep Learning and Cost-Benefit Analysis". The manuscript develops a strategic evaluation framework for natural disaster risk mitigation strategies. A two-stage model: using a deep learning and cost-benefit analysis is introduced. Data of insured loss amounts due to natural disasters associated with the risk indicators were collected and used to train and develop deep learning model. A data set of 458 cases was used to train the model and test its validity. Root Mean Square Error was used to assess the Deep Neural Network (DNN) precision of the prediction model and was compared to Multi Regression Analysis (MRA). The DNN was found to be precise compared to MRA with number of hidden layer – 3, and 25 hidden nodes at each layer. 474 disaster risk reservoirs and 291 maintenance projects were used as validation case for the BCR analysis stage. Loss rate was found to significantly decrease (82%). Despite the fact that rainfall during the test cases decreased by an average of 35% the model yielded significant improvement in disaster risk mitigation.

The paper deserves minor revisions as follows:

- The title of the manuscript is too long, please consider shorter title such as: "Natural Disaster- Mitigation Using Deep Learning and Cost-Benefit Analysis".
- The abstract does not reflect the novelty of the methodology. Please consider revision: stress the validity of findings and efficiency of the framework.
- The literature review may be extended to applications of Deep Learning to risk assessment – Please review and consider the following literature: ( (Khosravi et al. 2020; Zhang et al. 2022; Yi et al. 2020; Al Najjar et al. 2021; Moishin et al. 2021; Shane Crawford et al. 2020; Sugiyarto and Rasjava 2020; Kim et al. 2021));
- Please add a research framework diagram, emphasize the core phases of the methodology;
- The training phase of the DNN must be significantly improved: please provide figures with distributions of the core variables, Please provide distribution figures of the training data (Loss ratio, building type, maximum wind speed, rainfall and PGA), the MRA model and the DNN output. This is essential to for legibility and scientific soundness.
- Please add keywords.
- Please see further remarks and corrections in the attached file.

Good Luck!

Ref.

Please also note the supplement to this comment:

<https://nhess.copernicus.org/preprints/nhess-2021-294/nhess-2021-294-RC1-supplement.pdf>