

Responses to the Reviewer 2:

► Comment 1

(General comment)

The research deals about evaluating specific degradation and sediment yield in South Korea. The procedure is a composed by different stages that considers: 1) analyzing measurements of sediment yield from 62 streams/rivers and 14 reservoirs, 2) developing a regression / tree mining model for sediment yield in 47 up-streams catchments, 3) using RUSLE with mapping variables to validate the model, 4) using 16 ungauged watersheds to validate empirical data, and, 5) remote sensing is used for spatial variables.

We founded the subject of the article interesting, but in general the manuscript is a little confusing on how the procedures are adopted. We had a more clear understanding looking back to the article Kang et al., 2019 where a similar research is conducted and explained in a more fluid behave. We think that the use of methodologies adopted should be follow a more linear explication of the procedures, we are a bit perplexed about the question of spatial resolution that can be interesting but that is to much in evidence in discussions. Some concerns are on the material and methods not really clear or reported from previous article where better explained (e.g. the use of TE, trap efficiency in in defining SD, specific degradation, questionable dealing on both the catchment and the reservoir; use and description of the Modified Einstein Procedure - MEP).

In general, our opinion is that the manuscript could be reconsidered for the publication in HEES Journal after a new submission.

Response ◀

We really appreciate the editor's and reviewer's effort in evaluating our manuscript. Your comments were extremely helpful in improving our paper. Following the editor's and reviewer's suggestions, we conducted thorough revision, and the point-by-point responses to each comment and suggestion are addressed below.

As you mentioned, this study is a comprehensive study involving previous study results, additional data, and new methodology. Moreover, we agree with your opinion that some important information reported in previous article has not been included. If you require us to add the information, we will briefly introduce them and cite those studies for potential readers.

Additionally, following your suggestion, the manuscript have been rewritten for better understanding.

► Comment 2

(Specific Comment-1)

L19. “significant parameters:”: the term significant, should have a statistical meaning.

We think the abstract it is a bit confusing when showing the procedures and the results should be more concise.

Response ◀

Thank you for your comment. Both the methods used for developing the model (i.e., multiple regression analysis and data mining technique) are based on statistical theory. As the “significant parameters” were decided based on statistical approach, We consider that the terminology would be valid to use.

Following your suggestion, we will revise the abstract to make it more concise.

► Comment 3

(Specific Comment-2)

L32-41 We are not sure that a pedagogic description of the erosion terms is necessary. In general, the introduction must give a larger spectrum of the state of the art that is much wide than that here showed.

Response ◀

Thank you for your constructive comment. We agree with your opinion that “a pedagogic description would be not necessary in the article”. However, considering the confusion in the terminology of erosion with other references, we have provided a brief explanation about the erosion term which is used in this article. If it is not necessary, we will consider removing it. Additionally, we will provide more recent references and wide spectrum of the state of the art in the revised manuscript.

► Comment 4

(Specific Comment-3)

L79-81.“When water enters a reservoir, the flow velocity decreases, flow depth increases, and sedimentation occurs as a result of the overall decreased transport capacity of the stream.”: it is true but, over a pedagogic approach, here not demanded, scientifically thinking, it is a bit more complex.

Response ◀

Thank you for your valuable comment. Following your suggestion, the sentence of pedagogic approach will be removed.

▶ **Comment 5**

(Specific Comment-4)

L84 sediment deposition rate ($\delta \cdot \rho \cdot Y$, $m^3 \cdot km^{-2} \cdot yr^{-1}$): in this form is not appropriate to call it like this, it is more an erosion/denudation rate in the end ($m \cdot 1y^{-1}$) (i.e., metres over the catchment surface in a period)

Response ◀

Thank you for your comment. We agree with your opinion that an erosion/denudation rate is more appropriate. As “erosion/denudation rate” and “sediment deposition rate” have simple relationship, we just provided “sediment deposition rate,” which is used in the original form as in survey report.

We will revise it, and sediment deposition rate will be changing as erosion/denudation rate.

▶ **Comment 6**

(Specific Comment-5)

L85: field measurements: this is maybe more a continuous monitoring of the dams

Response ◀

Thank you for your comment. K-water has conducted a sediment survey every 10 years for multi-purpose and storage dams from impounded water. In the sediment survey, the water elevation and ground level measurements were obtained to estimate the change of reservoir capacity. The reservoir capacity results were from field measurement data. If it persuades confusion, “field measurement” can be changed as “field measurement for continuous monitoring”

▶ **Comment 7**

(Specific Comment-5)

L89 impoundment: not sure it is the right term for that

Response ◀

Thank you for your comment. We have used “the measured reservoir capacity from the impoundment of water”. It will be changed as “the measured reservoir capacity at first impoundment”

▶ **Comment 8**

(Specific Comment-7)

Equations 1 and 2: x: not adapted mathematical notation

Response ◀

Thank you for your comment. We will revise it.

▶ **Comment 9**

(Specific Comment-8)

Equation 2 (Specific Degradation): $\delta \square \ddagger \delta \square \square$, is the trap efficiency (%): we suppose this is more a fraction than a percentage. If using the term TE, the term Specific Degradation is questionable because is the part of sediment captured by the dam while the degradation of the surface catchment refers to the whole sediment eroded.

Response ◀

Thank you for your comment. We will express efficiency as percentage.

As mentioned, the trap efficiency of reservoir is approximately 96%, implying that most of the sediment is captured by the dam. Additionally, the specific degradation of the reservoir provides higher value than stream located upstream of reservoir. Based on this result, we consider that the term “specific degradation” can be used.

▶ **Comment 10**

(Specific Comment-9)

Caption Figure2: maybe add that are average values

Response ◀

Thank you for your suggestion. We will revise it.

► Comment 11

(Specific Comment-10)

L100. The Modified Einstein Procedure (MEP) should be at least briefly described and why the author choose this procedure (maybe suitable to this kind of data or study site etc.)

Response ◀

Thank you for your comment. We considered that “MEP” is a common method for estimating total sediment load, and the conservative methods for estimating the specific degradation would be required to compare previous empirical models.

We will provide a brief description and reason for using this method.

► Comment 11

(Specific Comment-10)

L111-190. We suggest to better structure this part to give a more clear presentation of the models, it is a little bit confusing and sometimes not enough well in details for equations. Additionally, some terms are not clear, W versus WW for instance (Eq. 13, 14, 16, 17) or the eq. 15 itself.

Response ◀

Thank you for your suggestion. We will divide the Section 2.2. into several sub-sections and add specific information about model development process.

► Comment 12

(Specific Comment-10)

Is a bit confusing the part of models, showing a sort of evolution of previous models; we think a better structured explication should help.

L250-255. The use of SDR from the literature as in figure 8 is in general allowed, but should pay attention to the specific condition of the reservoirs, being the SDR very dependent on the specific vegetation of the soil (as also observed in this research) and connectivity condition of the reservoirs.

Response ◀

Thank you for your suggestion. The proposed models were developed using additional data, and they provide a better predictability. We will add additional structured description about this.

We completely agree with your opinion that SDR values are extremely site dependent. The response for General Comment from Reviewer 1 could sufficiently answer this question. Additionally, the reservoir data were not used for model development. They are provided in Fig. 8 to support the reliability of using SDR data from the literature.

► Comment 13

(Specific Comment-12)

Discussion

Here, we talk about processes (eroding land surface) and a methodological issue, spatial resolution. We are not sure a methodological issue is important, as it is not the core of this paper, while the process has a limited discussion.

Response ◀

Thank you for your comment. A methodological issue is not a core of this paper; however, we consider that this section efficiently supports the result of the suggested model and geospatial analysis. Moreover, it provides important results regarding a counter-intuitive relationship (line 277) and sediment characteristics in South Korea (line 279). We will add additional details discussing this process (i.e., limitation of our study, and future work).

► Comment 14

(Specific Comment-13)

Conclusion

All the main finding are evoked, maybe a more synthetic or better structured presentation should help.

Response ◀

Thank you for your comment. We will provide a better presentation of our study.