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## Reply on RC2

Fátima Arroqante-Funes et al.

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Author comment on "Global assessment and mapping of ecological vulnerability to wildfires" by Fátima Arroqante-Funes et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-285-AC1>, 2022

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Dear referee,

Thank you for your time on our manuscript and thoughtful comments, as well as for highlighting the weaknesses of this version. We take their recommendations very seriously and revise the manuscript accordingly.

Your input is positive and by following your suggestions we will be able to strengthen the wording and understanding will need more detail as needed as well as justify the selection of integration approach for the global scale.

We hope that we have given the necessary answers to the suggestions and addressed all your doubts so that it is suitable for publication.

We have provided a detailed response to their comments below. Your comments are in bold and our responses in normal font.

### REPLY

**The manuscript addresses a proposal for assessing global vulnerability to wildfires using ecological value and post-fire regeneration delay indices.**

**It is an interesting work that is undoubtedly timely, that addresses the disturbance that fires can cause in ecosystems through pre-existing variables, which could eventually support resource management and conservation policies. The work is well supported, well structured, and well presented.**

First of all, we would like to thank the reviewer for his/her review of the manuscript, constructive comments and suggestions to improve it. We have carefully considered his/her comments, especially to clarify the writing of the manuscript as well as the methodology used to cross the variables.

### Global

**The variables and indices used are the results of studies independent of this work. Thus, they are not normalized in terms of spatial resolution, which could eventually mean a problem in the integrity and uniformity of the information representation.**

Thank you for your appreciation and for highlighting the challenge that the scientific community faces daily when using pre-existing databases. To address this challenge on a global scale, in this paper it was decided to work at the ecoregion level by summarizing one value per variable for each ecoregion. This was possible through different statistical methods suggested by different authors as reflected in the bibliography, such as the mean, species richness correction factors depending on the area, among others

**By combining different variables of different nature and origin, it may be possible to apply a multicriteria analysis instead of a cross-tabulation.**

The multicriteria analysis for a local/regional scale is interesting and enriching since it is easier to find a panel of experts representative of the territory. But in contrast, for a global scale it would not be relevant given the difficulty of finding representatives of the entire territory of the Earth. This would result in a biased study based on the territories of which it was or was not representative (Borrero & Henao, 2017; Hämäläinen & Alaja, 2008). For this reason, it was decided to use the cross-tabulation integration methodology that tries to be as objective as possible, also used in spatial studies at global scale (Chuvieco et al., 2014).

Borrero, S., & Henao, F. (2017). Can managers be really objective? Bias in multicriteria decision analysis. *Academy of Strategic Management Journal*, 16(1), 244-259.

Chuvieco, E., Martínez, S., Román, M. V., Hantson, S., & Pettinari, M. L. (2014). Integration of ecological and socio-economic factors to assess global vulnerability to wildfire. *Global Ecology and Biogeography*, 23(2), 245– 258.  
<https://doi.org/10.1111/geb.12095>

Hämäläinen, R. P., & Alaja, S. (2008). The threat of weighting biases in environmental decision analysis. *Ecological Economics*, 68(1-2), 556-569.

### **Detailed Comments**

- **In lines 17-18, the authors mention "The results showed that global ecological value could be reduced by as much as 50%, due to fire perturbation of ecosystems that are poorly adapted to it." Consider rephrasing "The results showed that global ecological value could be reduced by as much as 50% due to fire perturbation of poorly adapted ecosystems."**

It will be done in order to improve understanding as suggested.

- **In table 1 (line 116), "Conservation State Index," would be better to use "Status" since Status is the precision of describing the situation while State is a general description... except for your best opinion.**

It will be done, sorry for the confusion since what you explain is exactly what we wanted to express. Thanks for the clarification.

- **3. Recommendation: Specify the resolution in meters (as is done for other spatial variables) for Burnable Area (Line 134).**

The information suggested is in the manuscript on different lines due to the previous process applied. The information was in line 132 : "... 300m". Then, the database was resampled at 0.25 deg (line 134) which is the resolution of the work.

- **The meaning of the phrase "Monotonous linear way..." is not understood (line 195)**

We are going to improve on the explanation of it in the manuscript. In other words, all the values of the different variables take the range from 1 to 100 through a linear function (particular for each variable, depending on the maximum and minimum value of it).

- **(Lines 257-259) "These variables were multiplied by their weight (Table 3) and then added together to obtain the Conservation Status Index". It is not specified how the weight values are obtained.**

The information suggested is in the manuscript and this comes from the cited bibliography, line 257: "...as proposed by Burgess et al., (2006) and by Ricketts et al., (1999)."

The explanation of that will improve in the next version of the manuscript.

- **(Line 281) "two cartographies" looks like it should be "two maps." or "ecoregions cartography"**

It will be done in order to improve understanding as suggested.

- **In the integration of the adaptation of the vegetation to fire regimes, several variables were considered (lines 282-289). The integration of the categories (fire regime and natural condition fire) explained in these same lines seems not to be objective, but subjective, which could be different if a multicriteria analysis is applied.**

Thanks for the suggestion of the multicriteria analysis tool. But as I have explained previously in this post, finding a panel of experts to be representative of the entire Earth is a real challenge. If we do not have a good representation, the result will be biased (Borrero & Henao, 2017; Hämäläinen & Alaja, 2008).

On the other hand, we will work to improve the explanation of this section in the next version of the manuscript in order to express to the reader how objective we have been when applying the cross tabulation.

Borrero, S., & Henao, F. (2017). Can managers be really objective? Bias in multicriteria decision analysis. *Academy of Strategic Management Journal*, 16(1), 244-259.

Hämäläinen, R. P., & Alaja, S. (2008). The threat of weighting biases in environmental decision analysis. *Ecological Economics*, 68(1-2), 556-569.

- **The Biome area assessment developed (lines 393-424) analyzes land cover data with the vulnerability zones in different ranges resulting from this study. It is undoubtedly important for prospecting purposes; however, it would be necessary as a context and as a contrast of the results; have carried out an analysis of the historical information on fires in a recent period with the affected land covers; which would also lead to a discussion.**

Thank you for your interest in this work and for your suggestion. One of the objectives of

this work is to obtain the vulnerability to fires on a global scale and the databases and methodology used in it take into account a wide period of time in order to collect the average behavior or pattern of the variables. With this, a vision "of the moment" of said vulnerability is achieved. On the other hand, as experts on the subject of (Adger, 2006; Birkman, 2006, Kienberg, 2013) point out, there are different spatio-temporal scales to carry out this study and each of them is equally accepted depending on the initial objective. For this reason, the suggestion of taking into account the most recent years would be of interest in the analysis of vulnerability presenting different scenarios. This is precisely the continuation of our line of research. Again, thank you for the interest shown.

Adger, W. N. (2006). Vulnerability. *Global environmental change*, 16(3), 268-281.

Birkman, J. 2006. Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies.

Kienberger, S., Blaschke, T., & Zaidi, R. Z. (2013). A framework for spatio-temporal scales and concepts from different disciplines: the 'vulnerability cube'. *Natural Hazards*, 68(3), 1343-1369.