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Discussions

Interactive comment on "Spatial indicators for desertification in south-east Vietnam" *by* Le Thi Thu Hien et al.

Le Thi Thu Hien et al.

anne.gobin@vito.be

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Reply to Reviewer #3

We thank Reviewer 3 for a thorough review and for highlighting interesting discussion points on the methodology used. Many of the comments raised in this review have helped reshape the discussion section or enabled a better explanation or justification of the methodology section.

The defined quality indicators are difficult to understand: 1. The climate quality indicator (CQI) is based on the average annual precipitation and reference aridity index and its temporal rate of change, neglecting the influence of other meteorological factors such as the wind, (the occurrence of strong land winds is mentioned in page 3, line

15), and the relative humidity. Why do not integrate these effects in a water balance in the air above the ground? Is there any rationale behind the selected threshold values used for the scores of the precipitation and aridity? Incidentally, the scores for the different magnitudes should have been better indicated in a table. We have made the text clearer and clarified our methodology better. As the reviewer rightly points out there was confusion in the initially submitted manuscript. The initial formula of the aridity index includes temperature based evapotranspiration according to Thornthwaite (1948). When using the modified Penman-Monteith equation (Allen at al., 1998), wind and humidity are incorporated. Both wind and relative humidity are important contributors to evapotranspiration, which is together with rainfall taken into account in the aridity index. An important improvement could indeed be a water balance and the incorporation of other variables in the climate quality indicator. We have taken up these points in the discussion section.

2. The soil quality indicator (SQI) includes the slope which is not properly an edaphic attribute. The texture scores should be based on the textural components, not on the units of a soil classification system what implies the contribution of other edaphic factors like rock presence, salinity, or depth, considered in other parts of the SQI. As in the previous indicator, the authors should have justified the limits between different categories. Why the presence of rocks and salinity are not better delimited? We concentrated on pedological properties of soil development, and hence the choice for soil classification related properties: the presence of rocks, salinity, profile depth, soil texture and slope. The inclusion of edaphic properties is a very valid comment, which we have taken up in the discussion. However, this suggested approach requires soil data at more sampling points than currently available in the study region.

3. The vegetation quality indicator (VQI) is loosely defined. Is the vegetation of the study region so homogeneous that does not require any specification of trees, shrubs, or herbaceous plants? Is it necessary to include both the NDVI and is time rate of change at the same level in the VQI? Correct and we provided further clarification. The

forest classification geo-database also includes other natural vegetation classes, ranging from broad-leaved evergreen humid forest to secondary natural dune vegetation. NDVI values are an indication of vegetation greenness and health; a declining change in NDVI indicates degradation.

4. The water management quality indicator (WMQI) is a mixture of very heterogeneous factors with the same level of influence. The water balance is not the volume of water used for irrigation. This volume should be expressed as volume per unit area to extend its potential use out of the study area. The groundwater capacity refers more precisely to a volume than to a discharge rate. The irrigation factors type and capacity are not similar as they appear in the WMQI equation. What relevance the canal density in the indicator? The existence of canals do not necessarily imply that they are in use. We clarified the explanation of the water use balance calculation. The water use balance is expressed per irrigation perimeter, and reflects the balance between demand and supply. Irrigation water supply discharges were provided by the water board, and also cropping areas but no exact location of the crops; hence the choice to categorize and score the different perimeters. The canal density refers to used canals, which were checked during field surveys in 2010. We have checked the explanations of the WMQI to clarify the calculations that we performed.

5. The risk indicator demands a sound justification. There are some formal aspects in addition to the convenience of tables to show the different scores for indicators and their factors: a. Is there a necessity to reinforce some of the statements with a host of references? The abundance of multiple references might be more an obstacle than a help for the reader. We agree. To avoid this confusion we have deleted the first paragraph of data and methods. The references and statements have been sufficiently covered in the introduction.

b. Some sentences are rather obvious (e.g. page 2 lines 25-26; page 3 lines 24-25; page 3 lines 31-32, page 4 lines 1-3; page 11 lines 14-15). We agree! Page 2 lines 25-26; Page 3 lines 24-25; Page 3 lines 31-32: a sentence has been removed. Page 4

lines 1-3; page 11 lines 14-15 have been rephrased to remove the rather obvious.

c. Some references are missing in the final list as the FAO-UNESCO of page 5 line 6- We have cross-checked the references; and added the missing reference to FAO-UNESCO-WMO.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-146/nhess-2019-146-AC4-supplement.pdf

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