

Interactive comment on “Identifying areas susceptible to desertification in the Brazilian Northeast” by R. M. da Silva Pinto Vieira et al.

R. M. da Silva Pinto Vieira et al.

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Dear Referee,

We are pleased to submit the revised version of our manuscript: Identifying areas susceptible to desertification in the Brazilian Northeast. Thank you for reading our manuscript and review it. We hope that the revisions and our accompanying responses will be sufficient to make our manuscript suitable for publication in Solid Earth.

Reviewer #1: Some linguistic mistakes have also been detected (particularly some literal translations from Brazilian Portuguese to English) but I am not the proper person to suggest corrections in this sense because English is not my mother tongue. Response: Regarding the concern raised by the use of English, it is worth mentioning

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that the manuscript was submitted to an academic editing service prior to the submission to Solid Earth. We recognize few words might have been altered after language review as recommended by the reviewers.

Reviewer #1: Well, in the Lavado Contador et al. (2009), the most-cited article dealing ESA Index, is possible to see that they present the methods chapter in only 3 sections (after Study area): [1] Environmentally Sensitive Areas, [2] Map validation and [3] Statistical methods. In the first section, they perfectly explain, using 2 tables and some paragraphs only, how ESA Index and their indexes were obtained and what indicators provide (please read pages 132-135). Please, consider a similar structure for your article.

Response: As suggested, Section 3 “Methods” was reordered as follow:

3.1 Physical Indicators

3.2 Socio-economic Indicators

3.3 Environmentally Sensitive Area Index

3.4 Validation

Reviewer #1: Related to graphs and tables as well as bibliography section, some formal changes are still needed. Furthermore, some indexes or indicators are called with different names. Even, map validation is commented at the end of the text but it is not referred in the methods section. These kinds of corrections and/or suggestions are better explained below in the specific comments.

Response: We checked graphs, tables and bibliography and do the necessary corrections, as suggested.

Reviewer #1: Some linguistic mistakes have also been detected (particularly some literal translations from Brazilian Portuguese to English) but I am not the proper person to suggest corrections in this sense because English is not my mother tongue.

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Response: Regarding the concern raised by the use of English, it is worth mentioning that the manuscript was submitted to an academic editing service prior to the submission to Soil Earth. We recognize few words might have been altered after language review as recommended by the reviewers.

Abstract

Reviewer #1: Line 6: "driving factors". I suggest using "influencing factors".

Response: We addressed this comment in Page 1, line 24

Reviewer #1: Line 8: "HDI". I suggest not using acronyms in the abstract.

Response: This comment was addressed in Page 1, line 26.

Reviewer #1: Line 14: "83.35 km²". I suggest that it is rounded to one decimal place.

Response: Corrected in Page 1, line 32

Introduction

Reviewer #1: Page 3228, lines 23-25: Overgrazing is one of the main causes of the increasing of bare soil surfaces (e.g. Pulido-Fernández et al., 2013: page 22, figure 6).

Response: This sentence was rewritten as: "This heterogeneity is induced by overgrazing, one of the main causes of the increasing of bare soil that facilitates water and wind erosion and accelerates the desertification process" in (Page 2, Lines 52-56).

Reviewer #1: Page 3228, lines 25-26: References in the text should be sorted in a logical order: alphabetical or chronological.

Response: As requested, references were ordered in Page 2, lines 55-56.

Reviewer #1: Page 3229, lines 1-6: The Introduction chapter is divided in 13 paragraphs. The first one addresses the global situation of drylands and it goes on in the 4th paragraph. Therefore, paragraphs 2 and 3 should be deleted. Response: Paragraph 2 and 3 were deleted

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Reviewer #1: Page 3229, line 7: "Forty four percent". I think it is much better to use always number in spite of words.

Response: Corrected in Page 2, line 57.

Reviewer #1: Page 3229, line 21: "relief". It is much logical to use "landscape"

Response: Corrected in Page 3, line 72.

Reviewer #1: Page 3230, line 20: "Lavado Contador et al., 2009a". Is not necessary to add a letter when is the first and only time that you cite works by this author.

Response: Corrected in Page 4, line 102.

Material and methods

Study area

Reviewer #1: Page 3231, line 21: The coordinates do not match with those displayed on the corners of the Figure 1.

Response: The figure was corrected in Page 30.

Reviewer #1: Page 3231, line 10: "flash". I think that you would to write "floods"

Response: Corrected in Page 5, line 145.

Selection of the susceptibility indicators

As above mentioned, after study area the methods must be re-structured and integrated in less sections (not a section for each indicator). Table 1 is very interesting and appropriated for this section Page 3233, line 3: "They were grouped in three sets: physical, biological and socioeconomic quality indicators". I completely disagree with this paragraph. I think you have to state what indexes you use and what indicators are used in each index. It is not logical to separate indicators in 3 groups and after to use 4 indexes. It makes confusion in the reader.

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Response: We have re-structured and grouped the method section in 4 steps (Page 6-10, lines 173-311) as follow:

31 Physical Indicators

3.2 Socio-economic Indicators

3.3 Environmentally Sensitive Area Index

3.4 Validation

Besides this, we included Figure 2 to facilitate the understanding of the reader (Page 31).

• Topography data, geology, geomorphology and pedology maps

Reviewer #1: Page 3233, line 8: "altimetry". I think is much better to use "elevation"

Response: Corrected in Page 6, line 178.

Reviewer #1: Page 3233, line 9: Why do you use surface break-lines? Please explain it better.

Response: As mentioned in page 6, lines 177-181, "The DEM was processed to derive elevation and slope angle and used to identify breaklines surface discontinuities where occur changes in the vertical curvature which are linked to lithological, pedological, geomorphological and vegetation characteristics. Therefore, breaklines often indicate the boundary between adjacent units on a map".

Reviewer #1: Page 3233, line 14: "reinterpreted". Probably the most correct is to write "rescaled"

Response: As explained in Page 6, line 188, "These basic maps were digitized and then rescaled, to scale of 1:500,000".

Reviewer #1: Page 3233, lines 15-16: "Valeriano (2008) and Valeriano and Rosetti (2008)". Please explain briefly in which consists this procedure because these works

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are written in Portuguese.

Response: We replaced the fore mentioned references by material published in English (see Page 6, lines 186-187 and Page 21, lines 774-775).

• Land use and land cover maps.

Reviewer #1: Page 3233, line 21: "Ninety". It is better using numbers. Response: Corrected in Page 7, line 209.

• Human development index (HDI) Reviewer #1: What happens with these areas that their HDI has a value between 0.60 and 0.69? Please modify properly the intervals?

Response: The intervals were changed to values from 0 to 0.49 represents low HDI, 0.5 - 0.59 medium, 0.60 to 0.79 high, and 0.8 to 1.0 very high (Page 9, lines 263-265).

• Method

Reviewer #1: Why Environmental Quality Index does not include climate or vegetation data? Please renamed to Soil Quality Index or Topographical Quality Index or something similar or to modify properly. Environmental is better using only to ESA index.

Response: : Because climate and vegetation/land use data are included in the Climate Quality and Management Quality Indexes respectively, Environmental Quality Index was renamed to Physical Land Quality Index (see Page 9, line 278). This index includes geology, geomorphology, pedology and slope, which are mutually related attributes.

Reviewer #1: Why Climate Quality Index is only composed by Aridity Index? You could add some variables such as aspect. For example, Lavado Contador et al. (2009) use 4 indexes: Soil, Vegetation, Climate and Management data. Regarding to Climate they use much many variables.

Response: Aridity index is the most important factor in the Northeast Brazil context. Other variable such as aspect has low implications since the region is located between

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the equator and the tropics and therefore insolation is independent of aspect. For instance, there is no scientific evidence that wind erosion is related wind direction. The most important factors in determining the vegetation characteristics of the area are precipitation and evaporation, which are included in the aridity index. Besides this, evaporation was estimated based on as insolation, temperature, wind speed and relative humidity. Despite the fact that the climate index in this work is determined only by aridity index, it is clear that implicitly includes several variables that determine the region's climate characteristics.

â€” Determination of the Environmentally Sensitive Area Index (ESAI)

Reviewer #1: Page 3237, lines 11-13: Please be consistent in the proposal of intervals. What happens from 1.50 to 1.75?

Response: This was corrected in Page 10, lines 298-299.

â€” Results and discussion

Reviewer #1: Page 3238, line 18: "Table 7". It is in the Table 8.

Response: Since table 3 was excluded, now table 8 is table 7 (see, page 29, line 873).

Reviewer #1: Page 3239, lines 8-9: This sentence is bad expressed. Please rewrite it.

Response: The sentence was rewritten in Page 12, lines 374-377.

Reviewer #1: Section 3.3 "Climate Quality Index". That is the aridity index. Please add more indicators to this index.

Response: As discussed before, in the section method, Climate quality index include several climatological variables in the estimation of evaporation, this is why we opted to keep Climate quality index.

Reviewer #1: Pages 3239, lines 14-24: These lines do not match with Climate Quality Index. They should be written in other part of the text such as that related do Manage-

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ment Quality Index.

Response: The lines were deleted.

Reviewer #1: Page 3240, line 4: "lower". I think that it should be written "lowest".

Response: Corrected in Page 13, line 392.

Reviewer #1: Pages 3240 and 3241, lines 26-27 and 1-3: Map validation should be explained in the methods section. Map validation is a key issue to make reliable the information provided in the maps.

Response: We've created the topic 3.4 Validation on the Methods section that describes in detail the methodology used to perform validation on the map in Page 10, lines 300-311, providing details about how the map was validated.

â€” Conclusions

Reviewer #1: Page 3241, lines 15-18: This sentence looks contradictory. Please rewrite it. References.

Response: The sentence has been rephrased to: "From a climatic point of view, the humid and sub-humid areas have low vulnerability. However, when management issues associated with land uses are taken into consideration, these areas become potentially susceptible to degradation" in Page 14, lines 427-429.

Reviewer #1: I think that to add the doi of each article is not necessary.

Response: The doi was not removed because editorial requirements recommend the use of the doi number in the references. See (http://www.solid-earth.net/Copernicus_Publications_Reference_Types.pdf).

Reviewer #1: Page 3242, line 9: "and Sala, O.A.". That is "Sala, O.E."

Response: Corrected in page 15, line 460.

Reviewer #1: Table 1 "Declividade" must be translated into English by "slope" and not

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by “declivity”.

Response: Corrected in page 23.

Reviewer #1: Table 3 This table does not provide relevant information. Please remove it.

Response: Table 3 was removed.

Reviewer #1: Tables 4, 5, 6 and 7 are not properly referred in the text.

Response: Tables 4, 5, 6 e 7 are in Results section, which is more appropriate in page 10, line 318.

Reviewer #1: Table 8 the differences between 2 periods are relatively low. Why 2000 and 2010 are compared? That is not stated in any part of the text. Are there any new political rule or law?

Response: As mentioned in Page 7, lines 205-209, “Between 2000 and 2010, North-east Brazil was the fastest-growing economy (IBGE, 2010) region of the country and has been undergone severe land use and land cover changes. Therefore it is crucial to asses if the combination of both effects, fast growth and sever land use changes, have impacted on the susceptibility to desertification/degradation of the region”.

Reviewer #1: Figure 1 What does it mean these capital letters? Are they acronyms of the name of federal states? Brazil and Equator are shown in Portuguese. Please correct it.

Response: Corrected in Page 30.

Reviewer #1: Suggested references:

Lavado Contador, J. F., Schnabel, S., Gómez Gutiérrez, Á., Pulido Fernández, M., 2009. Mapping sensitivity to land degradation in Extremadura. SW Spain. *Land Degradation and Development* 20, 129-144.

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Pulido-Fernández, M., Schnabel, S., Lavado-Contador, J. F., Miralles Mellado, I., Ortega Pérez, R., 2013. Soil organic matter of Iberian open woodland rangelands as influenced by vegetation cover and land management. *Catena* 109, 13-24.

Response: The first reference (Lavado Contador et al., 2009) was referenced in the text in Page 4, line 102. The second (Pulido-Fernández et al., 2013) was included in the text following the reviewer’s suggestion (Pag 2, line 64).

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/6/C1576/2015/sed-6-C1576-2015-supplement.pdf>

Interactive comment on *Solid Earth Discuss.*, 6, 3227, 2014.

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