

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

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Dear Prof Á. González-Pelayo

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.

Responses to the comments of Reviewer #3:

Reviewer #3: English must to be revised and literal translation from Portuguese language to English must to be avoid.

C1588

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 Solid Earth. We recognize few words might have been altered after language review as recommended by the reviewers.

Reviewer #3: table 1: “declivity” must be substitute by “slope angle”, etc: : :).

Response: Declivity was replaced by slope angle as suggested, see Page 23.

Reviewer #3: Some paragraph must to be re-written for a better understanding (i.e.: line 9 to 12 in page 3229):

Response: The fore mentioned paragraph was rewritten to: “Overexploitation of natural resources in extremely vulnerable regions can accelerate land degradation and desertification process, affecting ecosystem functions and decreasing productivity, biodiversity and landscape heterogeneity and represents a major threat to the environment and human welfare” (Page 2, lines 59-62).

Reviewer #3: References must be cited in text in a logical order (alphabetical or by year). Example: Pag 3228, line 25.

Response: As requested, references were arranged in alphabetical order (Page 2, lines 55-56).

Reviewer #3: Introduction” and “2.1. Study area” are well-defined Response: ok.

Reviewer #3: 2.2. Selection of the susceptibility indicator” should be changed to “2.2. Methods”

Response: As requested, the section was changed to 3 Methods” in page 6, line 162.

Reviewer #3: 2.2.1. Selection of the susceptibility indicators”. If the referee understand correctly, section “2.3.1. Quality index”, were developed thought already established indicators? or Indexes were obtained by an own methodology?

C1589

Response: As mentioned in Page 9, lines 271-762 “The methodology used to map susceptible areas to desertification was based on the MEDALUS methodology (Mediterranean Desertification and Land Use, by Kosmas et al., 1999), which uses geometric means of environment-state and response indicators. Each index is estimate from the combination of indicators of desertification, which depends on geology, pedology, land management, human occupation, and conservation policies (Figure 2).”

Reviewer #3: Can you explain how do you establish the Indexes weight? It is mandatory for the following sections. If Quality indexes are proposed and developed by authors, this sections must to be included in Results.

Response: “To identify areas susceptible to desertification, we evaluated eleven indicators of susceptibility to desertification (Table 1), based on previous studies of the area [Vasconcelos Sobrinho, 1978; Ferreira et al., 1994; Matallo Júnior, 2001; Lemos, 2001]. From Table 1, each indicator was sub-divided into various uniform classes. Each class receives a weight factor, related to the potential influence on desertification process that ranges between 1 (low susceptibility) and 2 (high susceptibility), producing 11 susceptibility maps (SM). The weight factors were assigned based on previous analyses of the literature [Crepani, 1996, Torres et.al, 2003, Alves, 2006, Santini, 2010, Symeonakis, 2013]” (see Page 6, lines 163-171).

ââ Abstract

Reviewer #3: Avoid the use of acronyms as HDI, it will be explained in the text.

Response: We have avoided the use the acronym in Page 1, line 26.

Reviewer #3: Round decimals (83.35 km² to 83 km²)

Response: We rounded to one decimal place, as suggested by the first reviewer in Page 1, line 32.

ââ Introduction

C1590

Reviewer #3: Page 3229, paragraph one does not give useful information, must be deleted. Other paragraphs must to be re-written for a better understanding. See paragraph 3 of the General Comments above.

Response: The Paragraph was rewritten as follows: “Overexploitation of natural resources in extremely vulnerable regions can accelerate land degradation and desertification process, affecting ecosystem functions and decreasing productivity, bio-diversity and landscape heterogeneity and represents a major threat to the environment, and human welfare” (Page 2, lines 59-62).

ââ Material and Methods

Reviewer #3: Page 3232, line 10, I suggest to include “flash floods”

Response: We have included the term in Page 5, line 145.

Reviewer #3: In the section “2.2. Selection of the susceptibility indicators”, page 3233, line 2-3, authors must to clarify why you grouped into 3 sets if afterwards you define 4 indexes. Going further, why not 2 groups: biophysical and socio-economical?

Response: We re-structured and grouped both groups as suggested, see Page 6-10, lines 173-269.

Reviewer #3: Page 3233, line 8, substitute “altimetry and slope” by” elevation and slope angle

Response: We replaced by elevation and slope angle in Page 6, line 178 and through the whole manuscript.

Reviewer #3: Page 3233, line 14 and 18, substitute “reinterpreted” by “re-scaled”

Response: We replaced for rescaled as suggested (Page 6, lines 185 and 188).

Reviewer #3: Page 3233, line 17-18, you must to refer which soil classification are using, World Reference Base (FAO), Soil Taxonomy???

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Response: As mentioned in Pages 6-7, lines 189-193 “The Brazilian System of Soil Classification is based on soil pedogenetic characteristics, and also uses morphological, physical, chemical and mineralogical criteria [Camargo et al., 1987]. The system is hierarchical and “opened” which allows the inclusion of new classes and enables the classification of all soil types that occur in Brazil.

Reviewer #3: Page 3235, line 11, and add reference of Atlas of Human Development in Brazil.

Response: We have added a reference to the Brazilian Atlas in page 9, line 267 and page 21, lines 765-768.

Reviewer #3: Page 3236, If Quality indexes are proposed and developed by authors, these sections must to be included in Results.

Response: Firstly, the quality index was renamed to environmentally sensitive area index in agreement with the MEDALUS methodology. This was clarified in Page 9, lines 270-276: “The methodology used to map susceptible areas to desertification is based on the MEDALUS Project model (“Mediterranean Desertification and Land Use”, by Kosmas et al., 1999), which uses geometric means of environment-state and response indicators. Each index is estimate from the combination of indicators of desertification, which depends on geology, pedology, land management, human occupation, and conservation policies”.

Results and discussion

Reviewer #3: Page 3237, line 10. In the equation, the term VQI should be EQI, to be consistent during manuscript.

Response: The acronym was corrected in Page 10, line 296.

Reviewer #3: In the section “3.1. Environmental quality index”, authors does not include geology neither geomorphology in discussion, only state the soil types. We know that two soil can be classified with the same name but they can have different soil

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properties since they are developed from different parent material. Example: Humic cambisol developed over schist and Humic cambisol developed over limestones, same name but different properties.

Response: Because of the large extension of the study area, which includes a large number of soil types, for brevity we described only the general characteristics of each indicator. In the latest version we added more information about the geology and geomorphology characteristics: “The eastern part of the study area is dominated by crystalline rocks. However, there is a predominance of sedimentary basins, located in coastal region and in the western part of the study area. To the south of the region, extensive karst formations can be found. Most of the study area consists of flat and undulating relief, but it is also noted the occurrence of steep formations and the presence of inselbergs” (Page 11, lines 338-346).

Reviewer #3: Page 3238, line 18, table 7 must be changed to table 8.

Response: The orders of the tables were changed in the text. In the latest version of the manuscript, table 8 is referred as Table 7.

Reviewer #3: Revise tables 3, 4, 5, 6, 7.

Response: Tables 3, 4, 5 and 6 are being referenced in the Results session (see page 10, line 318). The numbers in the tables was change because it was taken off the table 3 as suggested by the first reviewer.

Reviewer #3: Page 3238, line 18-19, change “totaled” by “reached”.

Response: The term was changed in Page 11, line 351.

The section 3.3. Climate Quality Index” must be re-written in correct English for a better understanding.

Response: For clarification, he paragraph was rewritten to: “According to the climate quality index (Figure 3c, Table 7), 42% of the area, under semi-arid climate highly

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susceptible, while 38%, classified as dry sub-humid, is considered to be of moderate susceptibility. Finally, 20% of the area, where the climate is sub-humid to humid, is considered as having a low susceptibility. From a climatic point of view, in the coastal region annual rainfall exceeds 1250 mm. To the west, annual rainfall is around 1500 mm, while in the semi-arid interior annual rainfall is less than 1000 mm, ranging from 350 to 750 in several areas mm [IBGE, 1996]" (Page 12-13, lines 378-385).

Reviewer #3: Page 3240, line 3, add Table 8 in text where we can find data.

Response: The orders of the tables were changed in the text. In the current version of the manuscript, Table 8 is #7 (Page 29, line 873).

ââ Conclusions

Reviewer #3: First paragraph are not a conclusion. It is state of the art, so I recommend deleting or including in the Introduction. Summarize conclusions.

Response: The first paragraph was deleted.

Reviewer #3: Table 1, change declivity by slope angle.

Response: Declivity was change to slope angle in Table 1, Page 23.

Reviewer #3: Table 2. Authors define Rock outcrops as rock surface or covered by coarse rock fragments. This is not true since in terms of hydrology and erosion, rock fragments over soils works in a different way that a real rock outcrop. Re-define in table

Response: The term was redefined in Table 2 as requested, Page 24.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/6/C1588/2015/sed-6-C1588-2015-supplement.pdf>

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