

***Interactive comment on* “Reviews and syntheses: Influences of landscape structure and land uses on local to regional climate and air quality” by Raia Silvia Massad et al.**

Anonymous Referee #1

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Review of bg-2018-419: Reviews and syntheses: influences of landscape structure and land uses on local to regional climate and air quality

Summary The authors aim to review how land use affects climate and air quality. They present a framework for categorizing land use, and apply it to different aspects of the earth system, in order to demonstrate relationships between biosphere, climate, and air quality. They also present current challenges to understanding the effects of land use on air quality, provide suggestions for different groups to work together to address these challenges.

Overall impression

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I appreciate the effort to synthesize this information, and I generally agree with the abstract, but this paper falls very short of its goals. It is poorly organized, repetitive, inconsistent in its application of the framework, contains enough awkward language up front that the goals of the paper are not clear, and the conclusions do not follow from the information presented. Additionally, there isn't a unifying story to make sense of the extremely diverse information presented. For example, the air quality aspect is in the title and highlighted in the abstract, but is not addressed until page 23, and then only elaborated upon in a few sections. Also, main conclusions focus on model shortcomings, but there isn't a modelling review included.

It seems to me that this is about 5 papers mashed into one. Most of the text reads like a list, and links and meaning across the different sections and information are not made. The middle section alternates between pedantic textbook material and an uncritical presentation of many studies. I suggest that the authors think about what point they want to make, and focus on that point. For example, the material is here for a review of land use and air pollution. But there is a lot extra physics information that doesn't need to be presented in order make the point that the physical processes are an influence. Here are some suggestions:

- 1) The introduction and framework are general and vague. Make a solid, but concise, assessment of land use/cover change as a foundation, with literature to back it up, and move on to the effects you want to review.
- 2) The land categorization is applied inconsistently, probably due to its overlapping nature. Maybe delineate by urban, agriculture, and other lands. Part of the confusion and repetition arises because the urban changes are land cover changes, but these two have been separated.
- 3) The physical, biological, chemical distinction does not work. The physical isn't related to the rest (except in 4.3 where is it relevant and sufficient), and the biological and chemical are both about biological emissions, with a fuzzy distinction between primary

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biogeochemistry (co₂, ch₄, n₂o), and trace gases and aerosols. Stick to the chemical species you are interested in, and organize them around the land categories or land changes.

4) Develop meaning and relationships through the presentation of the literature. Having separate discussions later, or pedantic explanations before, leaves the information essentially as a list, and the later discussions become repetitive and do not have the references to back up statements.

5) To show integration of processes, put them in the same section. Present evidence for each one and the evidence for how they interact. Segregating them by section makes it difficult to make linkages without repetition. For example, section 4.3 starts to tie together vegetation, boundary layer, and air pollution, and is understandable without the lengthy textbook sections in part 3.

6) To criticize models, you need a model review.

7) To make conclusions about what is lacking, the gaps and limitations of existing work need to be explained in the review, rather than listing all the literature results as facts. Currently, the paper reads like everything has been figured out, but the conclusions state that hardly anything has been figured out. The shortcomings of the models are not reviewed, but are presented as main conclusions.

Specific comments/suggestions:

Abstract (page 1)

physical, chemical, and biogeochemical land-atmosphere interactions is a very broad topic, while the paper focuses on air quality impacts of land use. the abstract needs to be clear about the focus of the paper.

line 18: “at” to “and”

line 27: “non-existent” is more common than “inexistent”

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line 32: delete “but”

Introduction

The focus on urban/peri-urban and air quality is not clear. until the last few sentences This leaves the reader wondering why the rapidly growing body of literature on the effects of LULCC on the earth system is not accounted for (only a few papers are cited in the intro).

page 2, line 7: Not sure that anthropized is a word. Anthropogenic seems correct, although not usually applied this way.

page 2, line 9: reference for energy balance?

section 2 and use and intensification - this does not seem to be the appropriate title for section 2 - section 2 covers a lot more than this

page 4 lines 21-23: the section should start with this. it is unclear why the land use section starts with land cover. see comment above.

section 2.2: not much definition here. in fact you acknowledge that definitions vary considerably

page 5, lines 23-26: confusing- i am not sure what these numbers refer to.

page 6, lines 7-8: reference?

section 3.1 physical processes:

not sure all these equations are necessary. this whole section seems like a textbook. who is the audience? a shorter description of how things change is more meaningful. The description can cite various studies on these effects, and be more digestible by the reader. there are no citations in this section. actually, this section can be deleted because the next 3 sections are the ones that makes the point.

page 9, ine 12: incomplete sentence

section 3.1.1 land cover change

this section makes the case of the previous section.

section 3.1.2 agricultural intensification

page 12, line 29: and burning, and understory treatment, and different types of harvest, and planting

again, this section makes the point of section 3.1

section 3.1.3 urban intensification

this should probably be grouped with LULCC and it doesn't need all the references to the equations

section 3.2 biological

this textbook section is unnecessary as the following sections make the case

3.3 chemical

another long textbook section

3.3.1 land use intensification (page 23)

here is a review relevant to land change and air quality. But it reads more like a list than a review of evidence for making a point.

3.3.2 ag intensification

it seems like the previous ag section was cut short to put the information here

3.3.3 urban

page 23: what are the suggested trees in CA?

4 interactions

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4.1 local to meso and 4.2 ecosystem

these don't seem to have any relation to air quality

4.3 air quality

this is relevant, and expands upon sections 3.3.1-3.3.3 but now you have mashed together the land type framework

5 discussion

5.1

this is a lengthy repetition of the previous reviews without the citations

5.2 challenges

page 34

you really haven't shown the linkages and feedbacks. the information is all compartmentalized.

while your challenges are legitimate, it isn't clear how you reached them based on the previous reviews. there are little to no citations in this section, especially regarding modelling. you also don't acknowledge that models are essentially simplifications, and that they cannot contain every single detail, and that not every single detail matters for the desired outcome of a model.

the reviews need to make a critical assessment of the information, establishing meaning and caveats to the studies in this context, and showing where the gaps are, rather than listing all the information as fact. then you can use this analysis to develop your challenges.

5.3 interdisciplinary approaches

this is repetitive

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6 bridging the gap

while this is important, i don't don't see how it relates to this article

7 conclusion

there isn't a modelling review, so i don't know how presenting all of the field research generates the conclusion that modelling is poor

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