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Comment

## ***Interactive comment on “Horses for courses: analytical tools to explore planetary boundaries” by D. P. van Vuuren et al.***

### **Anonymous Referee #1**

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#### GENERAL COMMENTS

In this article, the authors address the state-of-the-art regarding the use of models to answer questions related to the planetary boundaries. They create a typology of "key questions" related to the planetary boundaries (though they say the typology can also be used more generally). They use this typology to explore how different type of models currently are being used to answer these questions.

This is a very useful and timely paper. The literature cited will be very useful to anyone attempting to model planetary boundaries. The typology also makes a lot of sense.

General comments for improving the paper:

- Title: "Horses for courses" – the metaphor is that you should use the correct model

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(horse) for the research problem (racecourse). This point does not come out clearly enough in the paper. First of all, it would be friendly especially for non-native English-speaking audiences, to spell out this metaphor somewhere. And then, as per the following points.

- Introduction: The background to the PBs is discussed comprehensively, but models are hardly discussed at all. (OK so the third paragraph is about disciplines, which are loosely connected to the models they use, but still this would be clearer if models were motivated here.) As a result section 2 is a little hard to follow as it's only in section 3 the reader gets to the discussion of the models which are, as I understand it, the main point of the paper. Can you motivate in the introduction a bit where the state of modelling is at and what you want to achieve with this paper? What is the problem or gap this paper will help people address?

- Discussion: Most of the discussion is little more than a summary of the previous two sections. I would like to see more synthesis, or at least comparison (e.g. which models are most useful for which Types? What are the big gaps?) This is another opportunity to connect back to “horses for courses”.

## SPECIFIC COMMENTS

- p1713 line 23. The SDGs obviously have been accepted by now.

- P1718 line 16. A reference or further explanation for the effect on deforestation on water availability would be nice.

- The title of section 2 involves ‘a systems view’. It is not clear to me how the typology constitutes a ‘systems view’. It is useful but not particularly systems.

- Why the “dose-response” terminology? I think it's confusing, especially when on p1718 you start acknowledging that the earth system is actually an interlinked social-ecological system.

- First sentence on p1719 (“The question whether...”): True, but I don't see how this

connects to the rest of the paragraph.

- P1724 line 16 “A key question is”. . . Yes this indeed is a key question, please don't just leave it hanging, try to answer it!

- P1725 line 3 “Other IAMs” – which ones? Please reference!

- Table 2: “Process-oriented”. What is this? It is not defined in the main text.

- The “alternative approaches” at the top of p1726 are not analysed at all. Should they be in the table? Social-ecological models are one of the key frontiers, is this not what the authors are saying? So shouldn't they be in the table? And which Types of questions are they best suited to answer?

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Interactive comment on Earth Syst. Dynam. Discuss., 6, 1711, 2015.

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