

Interactive comment on “Land use change associated with urbanization modifies soil nitrogen cycling and increases N₂O emissions” by Lona van Delden et al.

Anonymous Referee #2

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This is a significant contribution to our understanding of the nitrogen cycle in soil-plant systems, and how these are affected by urban development. The manuscript extends work published previously by the team (van Delden et al. (2016)), but as the authors have said the previous work was preliminary data for a shorter period of observation. A much clearer picture is presented in this paper.

However, the key point that comes across is that it is the process of land use change rather than the behavior of established turf grass that affects N₂O emissions. I think that the title needs to be changed to reflect this. Also, given the very wide range of possibilities covered by the words ‘land use change’, a phrase that means very different things to different people, the title should be much more focused, so we know

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that the paper addresses changes in N₂O emissions as a consequence of turf grass establishment – for lawns, golf courses, amenity grassland etc., and not a permanent change as a consequence of that change.

The behaviour of N depends on the different behaviours of ammonium and nitrate, as explained by the authors. Ammonium is affected by cation exchange, and so is affected by the CEC of the soil and by the mineralogical composition of the soil. While cation exchange is recognized as a process, no data for CEC are presented, and no description of the clay mineralogy of the soil is given. I appreciate that this could be a research project in its own right, but it would help to know what clay minerals are present – perhaps by reference to other published descriptions.

The reason for going on about that is that without knowledge of the CEC (at least) or the mineralogy of the soil, you can't really compare N emissions for different locations, as variation in the clay mineral type could well give rise to different N₂O emissions, all other factors being equal. That would be an interesting experiment to conduct.

I have some more minor comments.

1) P2 lines 9 – head or heat? 2) P2 line 31 – what industry? 3) P3 line 11: illustrate, not illustrates 4) P4 line 8 – do you mean 2/3 N by mass or by molar proportion? 5) Section 2.4. You say measurements were made on ‘fresh’ soil. Was this dried before analysis? Was the soil dried before LECO analysis? I found this section insufficiently detailed to enable me to reproduce the analysis precisely, and it is not clear how the measured analytes were back calculated to the soil under field conditions. Please clear up this ambiguity. 6) P9 line 26 – possibly, instead of possible? 7) Is it possible to calculate a nitrogen balance for these sites?

The references are a bit of a mess, which is surprising these days.

Missing from the bibliography are:

P1 line 23: United Nations 2008 P2 line 8: Grimm 2008 – 2 Grimm et al's are given but

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not cited P2 line 30: United Nations 2013 P2 line 34: AGO 2014 P3 line 2: ABS 2012 and Turf Australia 2012 P3 line 20: Moreton Bay Regional Council 2011 P9 line 29 and P12 line 7: it should be Barton et al P10 line 25: it should be Page et al

From the Bibliography the following appear not to be cited (I may have missed some):

Grimm et al – 2 references are given Hart et al 1994 Kaye et al 2006 Lorenz and Lal 2009 Community profile 2011, which is out of order Tratalos et al 2007 Newsletter 2012 again out of order

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