

Comment on soil-2021-18

Anonymous Referee #2

Referee comment on "The effects of sealing on urban soil carbon and nutrients" by Roisin O'Riordan et al., SOIL Discuss., <https://doi.org/10.5194/soil-2021-18-RC2>, 2021

General comments

The manuscript "The effects of sealing on urban soil carbon and nutrients" by Roisin O'Riordan, Jess Davies, Carly Stevens and John N. Quinton presents an interesting study on sealed and unsealed urban soils (Technosols), their physical soil properties and their carbon and nutrient status. The data and information presented is useful to improve the understanding of urban soil carbon and nutrient budgets. Overall, the work is an important contribution to understanding the role and properties of urban soils, which have received insufficient attention to date. Therefore, I suggest a publication after some corrections.

I enjoyed to read the manuscript and think that this contribution fits perfect within the scope of SOIL and would be on great interest for SOIL readers. I leave suggestions, mainly as specific comments to improve the manuscript by clarifying small issues and some technical corrections. Very good presentation of the results. My comments are therefore mostly limited to the methods and the discussion. However, I have one major concern regarding the documentation of the urban soils studied (see point 6 specific comments).

I look forward to seeing this work published as an important contribution to the so far underrepresented field of urban soil studies.

Specific comments

- In addition to the important and as yet largely unexplored ecosystem services provided by urban soils (l. 24-27), these are also always associated with contamination (urban soil pollution through e.g., heavy metals). The authors should consider in the

introduction for the relevance of the topic as well as in the discussion whether this point should be (briefly) included.

- Authors should consider to include a brief discussion on urban soil structure (soil formation, stratigraphy) and spatial heterogeneity (l. 30-35). The role of urban soils, their functions and the fact that so far too little attention has been paid to them in research should be more highlighted in the introduction. See also: Lehmann, A. and Stahr, K.: Nature and significance of anthropogenic urban soils, *J Soils Sediments*, 7, 247–260, 530 doi:10.1065/jss2007.06.235, 2007.
- Author's mention "urban ecosystem services" (e.g., l. 67). These should be clearly defined in the introduction. With reference to the question: Which urban ecosystem services can be influenced by urban soils and their C and nutrient status?
- Regarding the study area map (l. 82) a localization of Manchester on the basis of a general map (location in the UK) would be helpful. Furthermore, the question arises whether the sampling sites in the north-east belong to the town of Rochdale? If so, this should be indicated. Either by labelling or by an additional detailed map in the planal map.
- Within the section "2.2. Soil sampling" I would like to encourage to add some additional information: a) describe the "litter layer" in l. 89, b) describe "imported construction materials" in l. 90, c) give information about the bulk density cores used (e.g., material, diameter). Additionally, information about the sample transport and storage (bags, vessels?) for the fresh soil samples are missing. Please add the information with regard to the subsequent analyses (e.g., C-analytics and plastic vessels would be incompatible)
- Regarding the soil sampling and urban soil categorization I miss information on the soil description as in the case of sealed soils: exact profile structure, soil type, texture, other properties and, in the case of greenspace soils, the horizon structure, texture and a designation according to WRB. Due to the lack of research on urban soils and their high heterogeneity, it would be desirable to obtain more detailed information on soil structure. For me, this leads to one (and the only) major concern, since differences in the later interpretation of the data obtained can also be attributed to the heterogeneity of the urban soils. I would therefore suggest the following improvements:
 - Add a brief description of profile structures, horizons and a designation according to WRB to the different urban soil categories within section 2.3.1
 - Define and name the type of artefacts (l. 101) found within the section 2.3.1 or later within the results
 - Figure 2 could be supplemented by specifying soil horizons according to FAO 2015, brief description or naming of the materials (especially for the sealing materials) and depth ranges.
 - Finally, it would be easier for the reader to get an impression if selected photos of the sampling sites and, if applicable, of the profile structure were summarized with a short description in an SI.
- A clearer formulation of which sample was used for each analysis should be provided (e.g., l. 128).
- Section 2.3.1 (l. 106-111) indicates that the level / proportion of artefacts was analyzed. The values or chairs should be provided within the results section or Table 1.
- Regarding the "additions of anthropogenic materials" (l. 236 as well as l. 255-256) and subsequently discussion: This point coincides with the previous one. Please specify the type and proportion of artefacts found, if you derive conclusions from these findings

- regarding the C pools in urban soils.
- Within section 4.1.2 and regarding the discussion of difference in C stocks of sealed and greenspace soil, please verify if the studied greenspace soils are “free” from anthropogenic influences? In my opinion, urban soils of greenspaces within a central urban area, have often been used for other purposes in the past. If we find green spaces with, for example, Hortisols today, they may also contain a large proportion of anthropogenic artefacts from earlier use. As you have written elsewhere, understanding the history of soil in urban areas is essential. Please consider this point in the discussion.
 - Statements about denitrification from l. 368 onwards are attributed, among other factors, to reducing conditions. However, these are not mentioned in the results (perhaps because of an incomplete description of the soils studied). How were the redoximorphic features determined (according to FAO, 2015)? What proportion do they account for and do they affect all SU soils?
 - Conclusion (l. 396): As you present a novel research for urban soil studies, please suggest specific suggestions for further studies based on your results

Technical corrections

- The term “wider urban C stocks” in l. 67 should be clarified.
- Please add a reference for the statement on the population (l. 75).
- Please add a cross-reference to Figure 1 (“Fig. 1”) at the end of the sentence in l. 77.
- Please add the value range of distances between sealed and greenspace sites (l. 88).
- The term “technosols” should be written as “Technosols” (e.g., line 100, 247, 268) within the entire manuscript. I am not a native speaker myself, but I think this would be the correct spelling for a proper name.
- Please give the information and specifications on the used pH probe in l. 123.
- Please add a reference for the LOI procedure in l. 132.
- Please raise the 3 within (g/cm³) in the caption of Figure 3.
- Regarding l. 277: Which type of minerals from concrete?