



EGUsphere, author comment AC2
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Comment on egusphere-2022-307

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Author comment on "Transforming living labs into lighthouses: a promising policy to achieve land-related sustainable development" by Johan Bouma, EGU Sphere, <https://doi.org/10.5194/egusphere-2022-307-AC2>, 2022

Reply to comment on egusphere-2022-307.

Alexandre Wadoux has made some highly valuable contributions to this discussion. Citizen science was not mentioned in the paper. Reports of the European Union strongly emphasize citizen engagement (EC, 2021, Dro et al 2022) though the latter report also mentions citizen science in section 4.1. But Wadoux is correct in stating that too little attention was paid to the role of citizens. As citizen science is a widely used term, discussion of the concept is needed.

Science can be defined as: *"a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe"* (numerous references, among them Bunge,1998). Following Irwin (1995), citizens can *articulate concerns and needs* and can *contribute knowledge* to the assessment of sustainable development (in the context of this paper). Figure 1 (line 260) is relevant here as it indicates various forms of *knowledge*, where the contributions by citizens at large will usually be of the K1-K2 type. But next to this, citizens can also contribute to *building* knowledge by gathering data as suggested by both Irwin (1995) and Bonney et al (2009). Examples elsewhere are counts of birds and observation of certain plants. In the context of invisible soils, activity of citizens is more complicated but can, for example, involve measurement of soil structure resistance by penetrometers and operation of proximal sensing equipment, when properly supervised.

But there is more. In 2015, 193 Governments approved the UN Sustainable Development Goals. Governments guide but also represent and, ideally, inspire their citizens. ("WE", line 267-283). When SDG's will not be met by 2030, this will be seen in the current policy discours as a failure of Governmental Policy. Instead, it is a failure of all of us ("WE") , to take steps to a more sustainable world. Unfortunately, Governments have failed to present the SDGs to their citizens in terms of a major societal challenge. When I mention SDGs at various talks, eyes tend to glaze over. There is an unfortunate gap between the policy arena and their citizens. I refer to a recent inquiry showing that 88% of Dutch dairy farmers don't trust Government (line 110). In any case, citizens and their action groups have *"articulated concerns and needs"* (Irwin, 1995) contributing significantly to establish a climate favorable to adopt the SDGs in 2015. This should be acknowledged as a substantial contribution.

But now, a next step has to be taken urgently as goals have to be reached by 2030. SDGs

and environmental ecosystem services have been defined and they need to be measured to see whether or not individual farms (or other forms of land-use operations) meet thresholds for each of these indicators. This requires direct no-nonsense contact between farmers and researchers. No more time for endless and all too often inconclusive discussions about desirable farming systems (lines 118-122). All systems will have to meet the thresholds and, if so, they qualify as an inspiring : "Lighthouse". However, thresholds for the various ecosystem services still need to be discussed and citizens will again have a role here, particularly because many thresholds will need to have a regional character. As mentioned in the article, only groundwater quality (SDG6) has so far a defined threshold. Greenhouse gas emissions/carbon capture need a primarily technical approach also considering national emission levels. For example, in the Netherlands agriculture only contributes 10% to greenhouse gas emissions while industry and traffic contribute 80%. It is clear where policies will have to focus! Thresholds for soil degradation (SDG 15) can be expressed by soil health but thresholds for biodiversity (also SDG15) still present a big unresolved issue. Focus only on nature quality in the NATURE 2000 areas defined by the European Union?

In summary, following the definition of Irwin (1995) citizens had a role in establishing the SDGs and, after essentially technical activities at the Living Labs, again in participating in defining socially acceptable (regional) threshold values for, in particular, biodiversity preservation. Once : "Lighthouses" have been established citizens have a major role in spreading the word as indicated in the paper.

Will different expectations of participants in the sustainability discourses , as discussed, be satisfied? Indeed: "what's in it for me"? Farmers will be satisfied as their income increases partly by qualifying for subsidies but particularly because the new system focusing on providing ecosystem services will present much needed clarity in terms of goals be achieved. Citizens should be satisfied and inspired when their overall role, as discussed above, receives more recognition and when positive results are reached in the real world. How about the science arena, and soil science in particular?

The role of science to develop measuring methodology will serve to illustrate their crucial function. By emphasizing the contribution of soil science to the sustainability debate in terms of : "*..contributing to ..ecosystem services*" (line 201) the soil science contribution could be lost in the interdisciplinary turmoil and its role might become unclear which would be unacceptable. (Wadoux et al, 2021). Of course, soil science provides a direct threshold for SDG 15 (soil degradation) in terms of a soil health assessment but it would indeed be relevant to also and more clearly address the effect of soils on the other SDGs. Soil moisture and nutrient regimes are crucial for production of healthy food (SDG2&3), water quality (SDG6) and greenhouse gas emission/ carbon capture (SDG13), as well as biodiversity preservation (SDG15). Modeling can show what effects inadequate soil health can have for each of these SDGs as was demonstrated by a series of papers for SDG2 by Bonfante et al (2019, 2020a,b) also considering climate change. Such examples are needed to illustrate the crucial role of soils in sustainable development, moving beyond SDG15.

Alexandre Wadoux is correct in stating that success directly depends on the personal attitudes of participants. Not all soil scientists have the needed level of social intelligence while not all farmers are open to a broad discussion. Careful selection of participants is essential. And, indeed, the : "Living Lab" approach has been presented topdown but can positively be seen as both a statement of trust in participatory research as well as an open and urgent invitation to act as no specific roadmap is presented. The research community needs to rise now to the occasion.

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