Living Labs and Lighthouses for all land uses

The article very well describes a practical approach for the Living Labs and Lighthouses concept of the Mission “A Soil Deal for Europe” (EC, 2021) on agricultural soils. The “Soil Mission” however has the ambition to cover all land uses to support Europe’s transition towards healthier soils. The discussions and literature on Soil health Living Labs (LL) and Lighthouses (LH) focus until now on agricultural settings, and although the proportion of urban and industrial soils within Europe is much lower than agricultural (forestry, and natural) land, a lot of “soil health benefits” can be achieved here. As stated in the Soil Mission Implementation plan “A Soil Deal for Europe” there are: 2.8 million potentially contaminated sites, but only 24% of the sites are inventoried and by 2018 only 65.500 have been remediated; only 13% of urban development takes place development on recycled urban land; and next to that urban and industrial soils can contribute with their ecosystem services to many challenges such as climate change, water regulation, biodiversity etc. (Van der Meulen & Maring, 2018)

To be able to cover all land uses in the 100 by the Soil Mission proposed LL (EC, 2021), it would be good to broaden the discussion on Soil Health LL and LH to urban and industrial land. There are several points, addressed in the article, that should be further discussed or elaborated to be able to also setup promising, practical and viable Soil Health LL and LH in urban and industrial settings.

1: scale and the regional / landscape multi-site criterion

Although not highlighted in the article, the Soil Mission Implementation Plan “A Soil Deal for Europe” indicates that living labs are collaborations between multiple partners that operate at regional or sub-regional level and coordinate experiments on several sites within a regional or sub-regional area (or working landscapes) The “multiple site demand” is logic for an agricultural LL with several agricultural sites in a specific soil-water-system. However, the demand to involve multiple sites within a region as a strict precondition for setting up a LL can hamper possibilities for industrial and urban sites. Because industrial and urban land use do not (in most cases) have such a direct link to soils as agriculture, the collation of sites in an industrial or urban LL could therefore better depend on the problem you want to solve or objectives you want to contribute to (such as contamination
or land subsidence or climate change adaptation). While there will not always be multiple (industrial/urban) sites with the same challenge within the same region available, a LL setup in which a collection of individual single sites in different regions/countries working together on a common challenge could be more promising. And at the same time, such a LL would still be effective to explore, develop and implement soil health improvements, under different circumstances.

For industrial sites it can be even more challenging to setup soil health LL, because soil health is not the primary issue for many industrial actors. Solving contaminated soils to comply to regulation is. And emerging contamination would be a very interesting starting point because they occur everywhere, regulatory frameworks within the different member states are in most cases not yet in place, techniques and management practices are still under development. The successful practices can become lighthouses that can be applied elsewhere.

Of course, one can think of successful LL in a regional setting in urban or industrial land. E.g. a transformation site, where underused sites are being regenerated and transformed to different kinds of beneficial (soft or hard) land use; or industrial / urban areas where circular economy approaches are being applied and soil/sand could be reused within the region, etc. However, these are timely processes. To set up a LL here, the time should already be right, and actors should be already engaged.

2: soil health for urban and industrial sites

Soil health is defined as “the continued capacity of soils to support ecosystem services” and is assessed through a set of proposed, measurable indicators (A Soil Deal for Europe). In Veerman et al, 2020), quoted by Bouma et al, 2022, underlying the commented article: soil health indicators are linked to the “needs of growing roots”: (i) lack of pollutants; (ii) good soil structure; (iii) relatively high organic matter contents; (iv) high soil biodiversity; (v) favorable soil moisture regimes (newly added); and (vi) favorable soil fertility.

These soil health indicators are practical and completely logical for agricultural use. However, for industrial and urban land (that is not likely going to transform to other land use in the near future), and where the biomass production is not the primary function, it would be good to assess if all these indicators should be equally important, or if we should develop another practical set of indicators linked to a specific land use and that take into account the for that land use important ecosystem services and objectives. When looking at the current soil health indicators, lack of pollutants remains a strong and valuable indicator, while we can relate it to human and ecological health. Structure and carbon content and soil moisture can be linked to climate change adaptation and mitigation objectives. These can be of importance, mainly in urban areas, but also industrial areas can benefit. Biodiversity can obviously be linked to biodiversity objectives that most urban areas will endorse. For industrial areas this is likely a more secondary objective (“nice to have”). Soil fertility could also be related to climate adaptation in terms of being the basis for green areas, but is probably not so relevant, also because urban and industrial greens will be chosen on other criteria than biomass production (biodiversity, attractiveness, resilience & robustness, native species, etc.). At this point it would be interesting to think if other soil health indicators could be of relevance for these land uses.

3: SDGs and ecosystem services as central concepts to a LL

For Living Labs, one could take the Soil Mission’s objectives (six “soil threaths”, and 2 more general objectives: increase soil literacy and; Reduce the EU global footprint on soils) as starting point. The article proposes SDGs and/or Ecosystem Services (ESS) delivery. SDGs can a good starting point for urban and industrial land use, because they
are adopted by all member states and are recognizable for municipalities, companies/industries. SDG allow better insight in the multifunctionality of land and the different tradeoffs and synergies (in a broader sense than soil) than when we focus on battling soil threats. As stated in the article, the SDG targets can remain rather vague when applied on a (series of) sites. The ESS concept can help making the objectives more measurable. But: when using multiple concepts, which need to be communicated to a broader audience, it would be good to use a conceptual model (CM) at the start of a LL, to describe the relations between SDGs – ESS - soil health – land use. The CM can support the narrative, show how they interact, how ESS can strengthen or weaken each other and how land management practices can be of influence. This should go beyond the LL scale itself, adverse effects on soil health elsewhere, as a result of the LL practice should be noted and avoided. This also relates with the Soil Mission Objective “Reduce the EU global footprint on soils”.

4: Thresholds to determine whether a LL becomes a LH

In the article, the SDGs are translated to measurable ESS (production of healthy food, water quality (link to Water Framework Directive, Nitrate directive) Energy, in terms of emission of greenhouse gases and carbon capture, biodiversity preservation and soil health (Life on land, SDG15)). Thresholds are being proposed for assessing whether a LL is a success and becomes a LH (When the soil is healthy and all ESS reach the threshold). For agricultural soils, there is quite some data on what a “normal” yield is on a specific soil. A threshold can be derived from this. For energy use and biodiversity this is already more difficult as shown in the article. For ecosystem services performance on urban and industrial sites (this can be the same set of ESS as used in the article, or an adapted set for the specific land use) data of what a normal performance of ESS is on a specific soil at a specific land use are not so easy to retrieve or lacking. When setting up urban and industrial LL, the indicators and thresholds should be carefully considered and, as is suggested in the article, practical cost and effort efficient measuring / monitoring methods should be developed / used.

Another consideration is if it is enough to comply with (upcoming) legislation / regulation (as the example in the article of water quality, which is very practical to choose as a threshold) or if we want to actually increase the performance of a certain ESS. For agricultural use, the primary ESS is retaining or improving yield while improving long term soil health, water quality, biodiversity, energy use, can be seen here as important, but are described more as boundary conditions. For other land uses, other ESS (biodiversity, energy) can be more important. It is therefore advisable when setting up a LL to think about the level of ambition for each of the chosen ESS and allow for a different order of importance and therefore for different thresholds.

Finally, some food for thought on Lighthouses: A Living Lab site becomes according to the article a Lighthouse when all set thresholds for soil health / ESS performance are reached. But is such a strict definition for a Soil Health Lighthouse needed or can we also define other “Lighthouses” that can emerge from the LL. Can a LH also showcase a cheap / easy / effective monitoring method for ESS performance? Can a lighthouse show 1 specific management practice that promotes just one or a few instead of all ESS in the LL? Or can a Lighthouse showcase good and effective soil literacy / education examples without yet reaching all soil health targets? So: can we set different "success criteria" within a LL (next to reaching thresholds for soil health / ESS delivery) and if we reach them, does that site than qualify as a LH on that specific objective?

5: Business models for the LL

The Mission “A Soil Deal for Europe” mentions thanew (policy) incentives and business models are needed to reward soil beneficial practices by land managers, agri-food system
players and other actors across value chains. An important part when designing a LL is to consider the business model during the LL lifespan but also afterwards (Lighthouse, and when it becomes “business as usual”).

Subsidies can be a tool to change our way of working, and support soil health. The article mentions potential targeted subsidies (from the CAP) to improve ecosystem performance, which is a very nice example. For urban and industrial soils possibilities for subsidies and rewarding mechanisms for improving soil health and ESS should also be further investigated. Also avoided costs and a rewarding system for solving problems (such as contamination) could be part of a business model. As mentioned in some examples in the article also the phase after the LL should also be further investigated for industrial and urban LL.

A good business model can contribute to the uptake of good practices by others and therefor to the upscaling from LL/LH experimenting to “the real world”.

6: actor involvement for the LL

As a final point: in Living Labs cocreation with multiple actors is a criterion. Ideally land users, scientists, policy makers and citizens collaborate within the LL setting. The article mentions the collaboration between government, people and science. It would be interesting to further elaborate the argumentation why the involvement of citizens on the topic of soil health – a specific land use is needed. "Because LL need to have the involvement of citizens" is not a good reason, nor for agricultural, nor for other soils. Also, without citizens the land use management can change by land owners in collaboration with policy makers and/or scientists. But, citizen awareness contributing to the willingness to pay more for sustainable products, change in consumption patterns or demands to trade systems is a more valid reason that can strengthen the business model. For other land uses than agricultural, especially urban, the citizen is a primary actor while the citizen is a land user and, in many cases, also owner. For industrial soils, the citizen stands further away and would not necessarily need to be involved in the LL setting, while land user, scientist and policy maker could be a strong coalition here. Again here, the link to and benefit from healthy soils need to be made clear when involving the citizen in a LL. So, for each setting the actor engagement and “what’s in it for them”, what are common grounds and shared objectives should be determined to ensure effective actor engagement.


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