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Stockholm University Baltic Sea Centre comments on EU Commission open consultation on the new soil strategy

The importance of healthy soils for the functionality of ecosystems, and therefore sustainable development, is more and more acknowledged but not enough dealt with in EU policy. The Commission initiative for a soil strategy is a welcome step in the right direction, continuing the discussions from 2006.

We, the Stockholm University Baltic Sea Centre, would like to underline that the soil strategy must include the linkages between soil quality and risk of nutrient leakage to surrounding waters and hence eutrophication. Such aspects include for instance the following:

- Good soil structure is crucial for minimising surface run off of phosphorus.
- [Legacy](#) of phosphorus in the soils is a major source for external input to water. For instance, in the Baltic Sea region, research shows that almost half of the phosphorus currently entering the Baltic Sea could derive from a pool of accumulated phosphorus on land (McCrackin et al. 2018). The role of legacy P and the properties, fate and management of soil nutrient inventories have to be considered in a future soil strategy.
- In order to reduce the risk of nutrient leakage from soils, [manure](#) has to be handled more effectively. The conditions of the soils influence manure management. The role of manure for improved soil structure should be part of the soil strategy.
- Reduction of nutrient sources from soils can have clear advantages for water quality, but there are trade-offs to be considered. For example, nitrogen additions have the potential to reduce carbon dioxide emissions and increase carbon storage ([Janssens et al., 2010](#)). Therefore, the cycling of carbon and nutrients should be monitored and considered together for effective soil management.
- Soil carbon stabilization (and associated nutrient retention) can be promoted by improving soil structure (e.g., no tillage) and increasing the diversity of residue inputs to soil (e.g., crop rotations, diversified agriculture, cover crops) (Lehmann et al., 2020).

A soil strategy must also consider chemical pollutants. The use of sewage sludge on soils can lead to accumulation of chemical pollutants in both soils and crops. This practice can also contribute to the spread of microplastics in soils, which may further

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leak to the aquatic environment, including groundwater. The present revision of the sewage sludge directive must be made coherent with a soil strategy.

McCrackin, M.L., Muller-Karulis, B., Gustafsson, B.G., Howarth, R.W., Humborg, C., Svanbäck, A., Swaney, D.P., 2018. A Century of Legacy Phosphorus Dynamics in a Large Drainage Basin. *Global Biogeochemical Cycles* 32, 1107–1122. <https://doi.org/10.1029/2018GB005914>

[Janssens IA, Dieleman W, Luysaert S, Subke JA, Reichstein M, Ceulemans R, Ciais P, Dolman AJ, Grace J, Matteucci G, Papale D, Piao SL, Schulze ED, Tang J, Law BE \(2010\) Reduction of forest soil respiration in response to nitrogen deposition. *Nature Geoscience* 3:315–322.](#)

[Lehmann J, Kaiser C, Kleber M, Maher K, Manzoni S, Nunan N, Reichstein M, Schimel JP, Torn M, Wieder WR, Kögel-Knabner I \(2020\) Persistence of soil organic carbon caused by functional complexity. *Nature Geoscience* 13:529–534.](#)