Environment, Food & Rural Affairs Committee: Soil Health Inquiry

Written submission of the Institution of Environmental Sciences (IES), February 2023

The Institution of Environmental Sciences (IES) is a professional body representing nearly 6000 environmental scientists and standing up for the voice of science, scientists, and the natural world in policy. We promote and raise public awareness of environmental science by supporting professional scientists and academics.

We are particularly well-placed to represent a transdisciplinary approach to environmental challenges, with members working in soil science, land condition, climate, nature, water, air quality, and anywhere else where environmental work is underpinned by science. As a result, the IES is uniquely positioned to examine interactions between complex natural and social systems from a scientific perspective.

We are a leading voice in 'systems thinking' perspectives and transformative approaches to change, such as the approach highlighted in our 2020 Report on Soil Health.

The Institution is happy to elaborate on any of the details in this response with further evidence in whatever form the Committee finds most appropriate.

Executive Summary

- Challenges for data gathering and measurement reflect the complex and contextual nature of soils and soil health. These challenges can be addressed through proxy indicators, holistic metrics which account for multiple dimensions or soil health, or action-based indicators to overcome data gaps.
- Further research is needed to secure the future of sustainable soil management in the context of challenges such as emerging contaminants, Perfluoroalkyl and Polyfluoroalkyl Substances, and microplastics.
- Government policy and regulation is making progress towards its ambition of sustainably managed soils, though further action is required to increase uptake of measures and to match the urgency of the challenges facing soil. An ambitious approach is required across different types of land use and cannot be confined to the agricultural context.
- While proposals for agriculture are ambitious and positive, they require urgent, widespread, and effective implementation which maximises benefits for soil on agricultural land.
- Soil and land are integrated systems which affect, and are affected by, other social and natural systems so drivers of unsustainable consumption and production across the economy should be addressed to ensure that the entire food system promotes good soil health and other environmental co-benefits.
- The Government must take a strategic approach to the full range of stressors affecting soil, including land contamination, soil erosion, and other forms of soil degradation. To that end, the relationship between government policy and environmental science remains of paramount importance.

How can the Government measure progress towards its goal of making all soils sustainably managed by 2030? What are the challenges in gathering data to measure soil health how can these barriers be overcome?

Data on soil health has historically faced multiple challenges, principally that agreement on what constitutes 'healthy soil' is not universal across contexts. Soil health is often contextual, influenced by the nature and history of the place it is found, as well as the subjective and sometimes conflicting functions assigned to it. There are no shortages of indicators or approaches to assessing soil, but there remain challenges linked to the extent to which they can apply across contexts.

Certain indicators can be utilised to make assessments of soil health, either as proxies or as indicators which are likely to demonstrate a particularly important ecosystem service is being protected, such as using soil organic matter, soil structure, microbial diversity, nutrient content, or geo-chemical health as proxies supported by specific biological and geo-chemical metrics. In the aggregate, using several indicator values as part of a holistic metric can support a more comprehensive understanding of soil health.

To overcome these challenges, the Institution published a report setting out a tripartite aspiration for soils: that they should be sustainable, healthy, and resilient. This approach should be at the heart of measuring sustainable management of soils, which cannot be achieved without recognising (a) the potential for unsustainable pressures on soil or other natural systems; (b) the salient qualities necessary for soil to remain functional and viable; and (c) the potential for risks and challenges, particularly those linked to interlinking environmental crises such as climate change.

During the ongoing development of the Healthy Soils Indicator (E7) for the Outcome Indicator Framework (OIF), the Government's challenge will be to construct an indicator which holistically combines these factors with a view to the inherent value of soil health and the multiple benefits it can provide, recognising the subjective context of different areas and uses of land, and the full set of risks associated with soil degradation and soil erosion.

The complexity of that challenge cannot justify a half-hearted effort and the chosen indicator(s) cannot be selected solely on a convenience basis; it will not be sufficient to look exclusively at where data currently exists and construct an indicator with the primary purpose of avoiding data gaps. The Healthy Soils indicator should be constructed to reflect the holistic health of soils and the multiple values they can provide for people and the environment. Data gaps should then be filled in order to contribute to the best possible indicator, rather than choosing an indicator to avoid the challenges associated with data.

Alternatively, action-based proxies may be appropriate in some contexts as an interim means of projecting expected soil health where data gaps exist. For example, practice-based approaches may be appropriate to evaluate the extent of uptake of science-led land management practices (particularly those that reflect the subjective nature and history of the soils to which they apply). While such an approach would not provide an indicator of the health of that soil, it could serve as an alternative to provide some information where data would otherwise be unavailable.

This specific example is relevant in the context of the Government's Environmental Land Management Schemes (ELMS). Through the Sustainable Farming Incentive (SFI), there will be some ability to identify an amount of land where sustainable agricultural practices are being employed (where these practices specifically relate to soil health), without the need to conduct additional data collection.

However, the process of publishing a baseline map of soil health for England, which forms part of the recently published Environmental Improvement Plan, should facilitate the closing of geospatial data gaps in England regardless. Although some indicator-specific data gaps may remain once the baseline map is in place, the need for proxy indicators may significantly decline.

Another challenge linked to data and measurement is the context of emerging contaminants, such as Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), microplastics, and other contaminants, which are likely to have increasingly significant effects on the health of soil resources. Further research will be necessary to explore the long-term consequences of these contaminants on soil and adjacent natural systems. The forthcoming Chemicals Strategy may be able to support this goal, as long as the context of soils is specifically addressed. Appropriate funding must be available to conduct such research.

Do current regulations ensure that all landowners/land managers maintain and/or improve soil health? If not, how should they be improved?

Many of the measures outlined in the Environmental Improvement Plan will support landowners and land managers to improve soil health. Acting with sufficient urgency to address the current state of soil health may require further regulations on three specific issues: (1) sustainable management of non-agricultural soils, (2) soils sent to landfills, and (3) bringing 40% of England's agricultural soil into sustainable management by 2028. The latter will be addressed in response to the next two questions.

Though the Environmental Improvement Plan's ambition to address all soils is welcome, there are not sufficient details of how this will be achieved outside the agricultural context. The decision not to publish a separate Soil Health Action Plan for England (SHAPE) poses challenges for the future of soils from a strategic perspective. There is a need for some form of framework for how soil health is managed across contexts, and the delay in creating such a strategic document raises concerns on the immediacy and efficacy of current plans.

Existing regulations do not sufficiently provide such a strategy-level approach to improving soil health, which will be vital for identifying the appropriate conditions to employ contextual measures, while maintaining a holistic view of the collective state of soil health and its contribution to the Government's other strategic ambitions, such as net zero, environmental land use, and restoring and enhancing nature.

The forthcoming Land Use Framework must meet that challenge in the broad context of land use, as well as the specific context of soil. Where the Environmental Improvement Plan identifies targets on the strategic level, further regulation is required to ensure that these are

met on the level of individual sectors across all types of land use, including agriculture, construction, and forestry.

Further regulatory tools to aid the improvement of soil health in non-agricultural contexts might include mandated soil evaluations or management plans as part of planning conditions for development, designation of wildlife buffers or corridors, or requirements for reporting on the management of soil in non-agricultural contexts. Options such as these should be thoroughly evaluated as work proceeds on both the Land Use Framework and the Outcome Indicator Framework, to ensure the most appropriate regulation possible outside the agricultural context.

Secondly, soil forms at slow rates, measured at around 1 tonne per hectare per year, or taking hundreds of years to form a few centimetres. In many areas, soil is being eroded far more quickly than it is being formed, so it is imperative that regulation is in place to prevent soils (other than those which are hazardous and untreatable) being sent to landfills. Measures to support this goal were included as part of the Environmental Improvement Plan, though these do not amount to an outright ban.

The revised Code of Practice and a Soil Re-Use and Storage Depot scheme will both be crucial tools to achieving this ambition, though the latter is not expected to begin until 2026 and the former may not sufficiently motivate change at the scale of urgency required. Stronger regulation would provide clarity to construction, landowners, and land managers, strengthening the uptake of the Code of Practice and increasing the pace of action to guarantee the end of soils being sent to landfills.

Will the standards under Environmental Land Management schemes have sufficient ambition and flexibility to restore soils across different types of agricultural land? What are the threats and opportunities for soil health as ELMs are introduced?

Through the Environmental Improvement Plan, the Government has acknowledged the importance to soil health of addressing the agricultural context. Current regulations may not be sufficiently encouraging action at the pace required to meet the Plan's objective of bringing 40% of agricultural soil into sustainable management in the next 5 years. Currently, where the rollout of Environmental Land Management Schemes (ELMS) is successful, those farmers enrolled on the Sustainable Farming Incentive (SFI) will engage in some activities relating to the sustainable management of soils.

The full set of standards under the SFI are not expected to be in place until 2025, only three years before the target date in the Environmental Improvement Plan (though some of the standards which relate directly to soil are already involved in pilot schemes). Where an SFI standards agreement runs for three years, guidance in certain contexts may only require organic matter to be applied to the entire area of land once in that period.

Furthermore, the extent to which peer-to-peer learning currently plays a prominent role in the promotion of sustainable farming practices and the uncertainties which have surrounded the implementation of ELMS are likely to be significant drivers against a timely and

widespread adoption, so further regulatory action may be justified to provide greater certainty and increase the pace of action.

Further regulatory options may be able to support increased take-up of the SFI and more rapid action by those participating in it. As it is vital to ensure a participatory approach to the implementation of ELMS that works with farmers and other land managers, further funding, engagement, and regulatory levers should also be used to encourage a broader suite of regenerative farming practices where they are appropriate.

Additionally, the Government has committed to sharing current guidance and best practice with farmers, so encouraging the use of resources such as the Environment Agency's 'Think Soils' manual or the Society for the Environment's Soils and Stones report could support increased adoption of sustainable practices. Further promotion of best practice and science-led approaches must continue as new research is conducted, so a strong relationship with environmental science will be essential.

Finally, in recognition of the complex and contextual nature of soils, there is a need for the specifics of sites to be reflected as ELMS is implemented in full. A key challenge for soils in agriculture has consistently been the implementation of generalised approaches through payment schemes, without tailoring them to the context of soil resources on the land in question. The design stage for proposals under ELMS should properly reflect the need for site-specific assessments of soil, as well as the impact on soil of activities undertaken as part of the scheme.

What changes do we need to see in the wider food and agriculture sector to encourage better soil management and how can the Government support this transition?

While the primary driver of good soil management in the food and agricultural sectors will be through ELMS, it will also be necessary to take a holistic view of soil and land as integrated systems which are significantly affected by the systems of consumption and production which drive environmental degradation across the environment.

Soil should be a consideration while other actions are taken to address those systems, such as to promote the circular economy, mitigation of climate change, and enhancement of biodiversity. The environmental crises affecting those natural systems are also linked to the causes of soil degradation and desertification, so a transformative approach to change in the face of those crises will be essential to supporting broader soil health as well.

The Government's approach to the food system should recognise that the quantity of food produced is only one of many services provided (though good soil health and nutrient content may also increase crop yields in many instances) and should therefore seek to maximise the other co-benefits of that system, including human health, protection of biodiversity, climate mitigation and adaptation, and other environmental benefits. Implementation of the recommendations of the National Food Strategy, especially the production of a coherent Land Use Framework, will be essential to achieving that goal.

What does UK Government need to do to tackle other stressors on soil health such as soil contamination?

Greater recognition is needed of the myriad and interlinking stressors facing soil. Currently, the policy approach to soil health typically prioritises addressing soil pollution by inorganic fertilisers, the effects of climate change, and soil erosion; while awareness of specific challenges is lower at the level of public engagement.

In order to fully address soil health, the Government should more explicitly recognise the extent of challenges facing soils and integrate responses to those challenges into its approach. Those challenges should include:

- Loss of organic matter, particularly as a result of cultivation or inorganic fertiliser use, impairing all the functions of soil, releasing carbon dioxide, and increasing its vulnerability to erosion and other forms of degradation;
- Soil erosion, particularly from uncovered soils, leading to permanent loss of soil resources and contributing to other forms of soil degradation;
- Sealing of soil, particularly by infrastructure or other forms of land use, preventing soils from performing functions and increasing the likelihood of run-off and other off-site harms;
- Soil compaction, particularly by machinery or livestock, reducing the porosity of soil with consequences for water storage and soil ecosystems;
- Loss of soil biodiversity, leading to reduced capacity for carbon or water storage and the loss of micro-organisms which support soil functions;
- Soil contamination, particularly by toxic elements or pollutants, damaging biodiversity and polluting groundwater or other natural systems;
- Soil salinization, particularly from coastal flooding or salt build-ups in irrigation water, reducing the fertility of soil and contributing to long-term desertification;
- Soil acidification or nitrification, particularly from pollutants or inorganic fertilisers, reducing fertility and functionality of soils, and contributing to nitrogen-based emissions;
- Other forms of soil degradation, particularly from emerging contaminants and issues where data may not yet fully exist on the potential consequences of that degradation.

The most important adjustment to Government policy to address this full suite of stressors will be to recognise them and include them in strategic plans for addressing soil, both in terms of the implementation of policies to address soil health, as well as in data collection and monitoring plans, so that sufficient evidence is in place to address them.

To that end, the Government should work closely with practitioners, particularly those across the environmental and soil science communities, which will be well-placed to address specific interactions between forms of degradation and policy activities. As plans to meet the Government's commitments on soil health are fully detailed and implemented, the Government should seek to engage with environmental science as much as possible to avoid unintended consequences.

Specifically on the example of land contamination, consultations with Environmental Health Officers and the Environment Agency during planning processes may be effective ways to incorporate expertise in specific decisions under some circumstances. Similarly, use of schemes such as the National Quality Mark Scheme for Land Contamination Management (NQMS) across land contamination reporting should be encouraged where appropriate.

Ultimately, many actions will be required to address the full range of stressors affecting soil health and most of the relevant decisions will be made at an individual site level. To that end, the Government's priority should be to put in place a coherent framework to address the protection, recovery, re-use, and enhancement of soils strategically. This would maximise the potential for decisions about land to incorporate science-led approaches to soil in all relevant decisions.

Further evidence

The IES recommends consulting the breadth of existing policy evidence already available on the subject of soil health, particularly the Institution's 2020 Report and the Society for the Environment's 2021 Report:

- Sustainable, healthy, and resilient: Practice-based approaches to land and soil management.
- Soils and stones report: sustaining our future by influencing change in the UK and beyond.