SOIL CARBON NOTE / SCIENTIFIC AND TECHNICAL COMMITTEE

CLARIFYING 'SOIL' VS 'LAND' TERMINOLOGY – TOWARDS IMPROVED UNDERSTANDING AND MANAGEMENT

INTRODUCTION

The use of terms relating to 'land' and 'soil' has become increasingly common in technical and policy settings as concern grows for the condition of natural and productive land resources and their capacity to help address food security and climate change challenges. Global response to these concerns has also seen related terminology extend into public media and community discourse, and in parallel with the wide usage and diversity of areas of interest there has inevitably been adoption of some variation in the way specific terms are applied and loss of clarity in their intended meaning. These inconsistencies are increasingly resulting in difficulties in interpretation and shared understanding which can act as a barrier to collaboration, effective investment to address knowledge gaps and support for improved management. This Soil Carbon Note aims to clarify the 'land' vs 'soil' terminology as applied to goals for more sustainable and regenerative management of agricultural (cropping and pastoral), forestry and natural resources and to provide some guidance on improving consistency for better understanding and land management decisions.

BACKGROUND TO LAND VS SOIL TERMINOLOGY

The terms 'land' and 'soil' rose in prominence following the United Nations World Environment and Sustainable Development Conference in Rio de Janeiro in 1992 (the Earth Summit), during which Agenda 21 was introduced with the aim of progressing towards a sustainable development model for the 21st century (hence its name). Agenda 21 has been signed by 172 United Nations (UN) member countries.

Five years after the Earth Summit, the 19th Special Session of the UN General Assembly held in New York[1] (June 1997) adopted a resolution for a Programme for the Further Implementation of Agenda 21 on Land and Sustainable Agriculture which stated that **land degradation and soil loss** threaten the livelihood of millions of people and negatively affect future food security, water resources and biodiversity conservation.

The resolution raised awareness internationally of the need for an integrated ecosystem approach to the protection and sustainable management of both land and soil resources and gave specific attention to combating and reversing above- and below-ground land degradation.

Over the three decades since the Earth Summit, the scope and priorities for sustainable management have evolved as understanding of environmental and socio-economic challenges have grown. The use of 'land' and 'soil' terms has become more widespread in scientific, policy and public spheres when referring to concepts such as sustainable land management, land degradation, soil health and soil degradation. However, within different contexts and agendas, each of these concepts may not be consistently or precisely defined.

The meaning of 'land' and 'soil' tend to have become somewhat blurred and, in some instances, appear to be incorrectly assumed to be interchangeable. Examples of definitions given in Box 1 show that, compared to soil, 'land' is defined more broadly to include both aboveground and belowground ecosystem components (Figure 1). However, the specific inclusion of both land and soil resources in the text of the Agenda 21 resolution identifies the need for sustainable management to prioritise soil resources for good land condition and, in doing so, the text points to the importance of not overlooking the largely unseen complexity and function of 'soil' in setting priorities for land management and policy.

The different but linked responsibilities and priorities of UN organisations leading the global response to environmental challenges and land-related policies and programmes help to explain some aspects of the emphasis in use of land vs soil terminology in texts on the mandate of each agency.

- The United Nations Environment Programme (UNEP) coordinates response to environmental issues and is described as the UN's leading global authority on the environment. UNEP GEO7 focusses on actionable recommendations for driving transformational change for: biodiversity loss; climate change; pollution and waste; and land degradation and desertification

- The United Nations Convention to Combat Desertification (UNCCD) is the main international agreement promoting practices that avoid, reduce and reverse land degradation and has a major goal of land degradation-neutrality (LDN) by 2030.
- The UN Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015 to promote actions to end poverty, protect the planet, and ensure prosperity for all by 2030. Under Agenda 2030, SDG 15 'Life on Land' which calls for the protection, restoration and sustainable management of land-based ecosystems directly addresses 'land' while SGD 2 'Zero Hunger' and SDG 12 'Responsible Consumption and Production' refer to 'soil' rather than land through their respective targets i.e., 'sustainable food production' and 'natural resources'.
- The Food and Agriculture Organization (FAO), is the UN agency leading international efforts to defeat hunger and achieve food security and explicitly addresses the need for attention to soils in productive lands. In 2012, the Global Soil Partnership (GSP) was established to position soils in the Global Agenda and promote sustainable soil management.

The links give examples of the terminology as used by these UN bodies for land and soil. Definitions applied are consistent with those in Box 1, but discipline-specific articles can differ in the emphasis or scope. In contrast to wording in the Agenda21 resolution, e.g. referring to 'land degradation and soil loss' or 'sustainable management of land and soil resources', terminology is now often less explicitly inclusive of both 'land' and 'soil' management. However, in assuming that 'land management' implicitly gives appropriate priority to 'soil management' or that the terms 'land' and 'soil' used interchangeably imply understanding of the complexity of all relevant ecosystem processes, there is a risk of lost opportunities for early interventions and optimal policy and support programmes. Moreover, the concept of 'land' may be interpreted more widely to encompass administrative, economic, social or spiritual dimensions and values, necessitating responses tailored to each respective context, as set out in the UNCCD's global land outlook.

Box 1: General definitions for some commonly used terms describing land and soil

Land is the complete terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system (UNCCD 2017).

Land condition encompasses aspects of the physical, chemical and biological characteristics of land that reflect how well the land can support ecosystems, agriculture and human activities. For a particular parcel of land, it reflects its ecological health, soil quality, and suitability for various uses.

Land health is the capacity of land, relative to its potential, to sustain delivery of ecosystem services (IUCN 2023)

Land degradation is the reduction or loss of biological or economic productivity of land, resulting in decreased yields, incomes, food security, and the loss of vital ecosystem services.

Soil health is the ability of the soil to sustain the productivity, diversity, and environmental services of terrestrial ecosystems (ITPS, 2020).

Soil degradation refers to deterioration in the quality of the soil and the resultant reduction in its functional capacity which may arise from processes such as erosion, compaction, and salinization due to weather extremes or poor agricultural management activities, that lead to decline of functions such as biological activities and nutrient cycling.

Sustainable land management is

i) (global perspective) the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions (www.fao.org);

ii) (local perspective) the adoption of land-use systems that, through appropriate management practices, enable land users to maximise the economic and social benefits from the land while maintaining or enhancing the ecological support of the land resources.

WHY THE TERMS 'LAND' AND 'SOIL' SHOULD NOT BE USED INTERCHANGEABLY

As illustrated in Figure 1, 'land' is more than its 'soil' component, also comprising vegetation, other biota, and the ecological and hydrological processes that operate within the complete bio-productive system (see Box 1; Figure 1). However, healthy soil is critical for good land condition and land health. If assessment of land condition relies on visual scores for indicators of major system components, such as vegetation cover, water quality and biodiversity richness, with soil rated on visible evidence of erosion, assessment is incomplete. Topsoil loss is an important indicator of degradation of soil structure but deterioration in physical, chemical and biological condition that determine soil's ability to function as a vital living system (Panagos et al. 2025) can occur earlier and monitoring soil condition variables such as soil organic carbon, pH (acidification), fertility, microbial biodiversity, and soil compaction, can enable earlier management interventions and potentially prevent more severe land degradation.

A broader concept of 'soil security' encompasses the maintenance and improvement of the world's soil resources to produce food, fibre and fresh water, contribute to energy and climate sustainability, and maintain the biodiversity and the overall protection of the ecosystem (Evangelista et al. 2023). This provides a more comprehensive understanding of soil in terms of its capacity, condition, and socioeconomic and political dimensions.

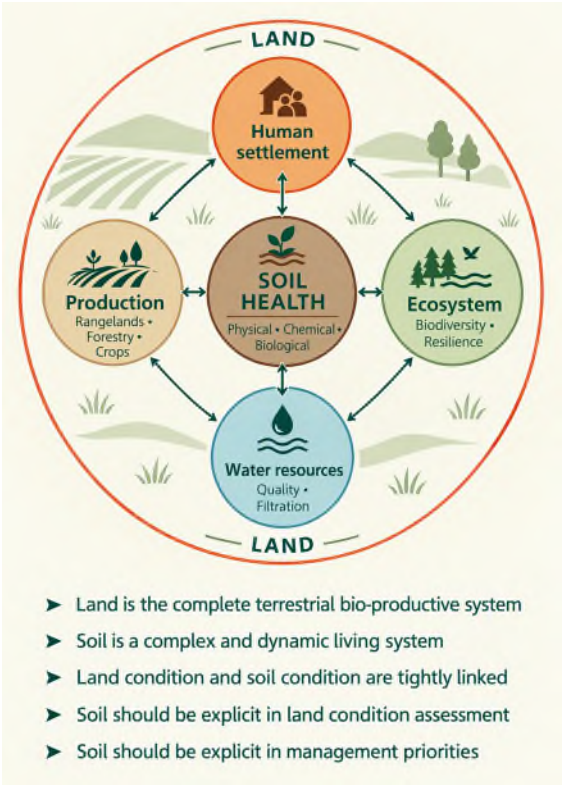


Figure 1. The interdependence of soil and land indicating the need for clarity and explicit consideration of soil in setting management priorities.

In summary, soil condition (and soil health) and land condition (or land health) are co-dependent. The provision of ecosystem services in natural, agricultural and forestry lands requires management to be based on better understanding of the dynamic and complex nature of 'soil' and 'land' systems and their interdependencies. Process understanding and a systems approach are best able to minimise the risk of unintended negative ecological or socioeconomic outcomes, with 'soil' and 'land' each addressed according to their specific dynamics and complexity. There is a risk of focussing on what is seen and treating soil as simply a passive substrate for land use. Overlooking the need to monitor soil's distinct, largely unseen, properties misses the opportunity to develop timely restorative management interventions even before signs of degradation are visible aboveground.

STEPS TOWARDS CLEARER COMMUNICATION ON LAND VS SOIL

The way **land vs soil** terminology has evolved and become embedded in a diversity of disciplines and organisational interests related to the benefits of sustainable management makes it both challenging and highly important to improve the clarity and consistency of communications. Over time usage appears to have evolved towards 'land' as a term to broadly encompass the intent of environmental and agricultural policies and initiatives. For example, the focus of the UNCCD on land degradation and desertification and global response to SDG 15, 'Life on Land', clearly necessitates a broad ecosystem-level perspective (Schulz 2011).

Monitoring land degradation using aboveground indicators of land condition, visible on-site or using remotely sensed imagery, is appropriate for assessment of large areas and results readily communicated for policy needs at a high-level. On the other hand, monitoring soil health or condition relevant to agricultural producers, agronomists, foresters, and ecologists requires more detailed and often costly measurements that also give valuable insights into land degradation as well as information for climate change and water resource management. Terminology use, therefore, depends on the intended audience but across different applications, awareness of the need for accurate definitions and clarity in the use of terms relating to 'land' and 'soil' is a common need. The following steps are suggested for clearer communication:

- Avoid using 'land' and 'soil' interchangeably and, wherever appropriate, adopt the practice of explicitly referring to the risks and opportunities for good management of each (as in Agenda21);
- Refer to internationally accepted authoritative definitions and specify the scope and context of each term that is introduced; and

- In developing policies and programmes for land and soil management, encourage an integrated systems approach that addresses both seen and unseen signs of land and soil condition, to assess the interdependencies, synergies and trade-offs of management options.

Some examples of organisations, agencies and governments are used to illustrate the use of land vs soil terminology in strategies and programs in ways that direct actions towards appropriate consideration of soil health to support positive outcomes for sustainable land management:

International organisations and initiatives

- The **Food and Agriculture Organization of the United Nations** (FAO) focusses on soils in productive lands. The FAO hosts the Global Soil Partnership (GSP) which has a mission 'to promote sustainable soil management for the major goals of food security, climate change adaptation and mitigation, and sustainable development for all' and the Intergovernmental Technical Panel on Soils (ITPS) which provides scientific and technical advice on global soil issues and sustainable soil management.
- The UN **Framework Convention on Climate Change** (UNFCCC) through its 2015 Paris Agreement (The Paris Agreement | UNFCCC) is a response to the global challenges of climate change mitigation and adaptation. Actions include soil carbon sequestration to constrain global warming, and the international "4 per 1000" Initiative also launched in Paris in 2015, has a specific goal to promote the role of healthy, carbon-rich soils. Over the past decade, "4 per 1000" has established networks and information resources on the crucial role of soils in sustainable soil management for food security and climate change.
- The **International Union for Conservation of Nature** (IUCN) World Conservation Congress held in Abu Dhabi in October 2025, adopted Motion 007: Soil Security Law establishing a global framework for protecting soil. It recognises soil as critical for climate, food, human health, and biodiversity, and urges nations to develop legal, policy, and restorative measures against soil degradation, and marks the first formal international push for comprehensive soil legislation.

Non-governmental organizations

- The **World Business Council for Sustainable Development** (WBCSD) program on Natural Capital and Soil Health engages major corporations, including in food and agriculture, to recognise soil degradation as a material business risk and soil restoration as an opportunity, using the language of business (risk, return on investment, supply chain resilience).
- **The Nature Conservancy (TNC) through initiatives on** Working Lands and Soil Health links on-farm soil health practices (such as reduced tillage and cover crops) to broader landscape-scale goals of water quality improvement and carbon sequestration. TNC provides a model for communicating the soil-land nexus.

National and regional governments

- The **Australian Government** formulated a 20-year plan, the National Soil Strategy 2021–2041, to prioritize soil health, enhance stewardship, and strengthen knowledge to ensure sustainable, productive land. The Strategy is supported by five-year plans (National Soil Action Plan 2023–2028), to manage, improve, and protect soils for environmental and economic benefits.
- The **European parliament** in 2025, adopted a directive on soil monitoring and resilience Soil Monitoring Law, obliging member states to monitor soil health, assist landowners in improving it, minimise loss of healthy soil areas, and manage contaminated sites. With the EU Mission Soil it forms part of a wider framework, which aims to improve and safeguard soil health as an essential part of Europe's green transition.
- **Brazil's** National Program for Soil Survey with Interpretation (PronaSolos 2018-2048) is a flagship initiative to strengthen evidence-based land governance by providing essential inputs for policies on sustainable land use, soil conservation, climate-resilient agriculture, environmental management, infrastructure planning, and disaster-risk reduction. PronaSolos supports Brazil's sustainability objectives and commitments on food security, climate adaptation, and environmental protection.

SUMMARY

As terminology related to the condition and management of land and soil resources has evolved and expanded since adopted into sustainability goals over 30 years ago, there has been, inevitably, some loss of clarity and inconsistency in how the key terms, 'land' and 'soil' are used. However, assuming an implicit understanding that 'land' management adequately prioritises 'soil' health or that using 'land' and 'soil' interchangeably gives sufficient clarity for development of on-ground management recommendations or sustainability policies represents a significant risk for ineffective or sub-optimal environmental and socio-economic outcomes. To manage this risk, it is recommended that attention is given to improving the clarity and precision in all forms of communication using these terms based on consistency with internationally-accepted definitions and, wherever relevant, taking a systems approach in which both 'land' and 'soil' contexts and their interdependencies are explicitly stated. Clarifying the terminology and ensuring the role of soil is visible will contribute to improved understanding, response to declining land condition and soil health, potentially improving welfare for the 3.2 billion people adversely affected by land and soil degradation (www.wad.jrc.ec.europa.eu).

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