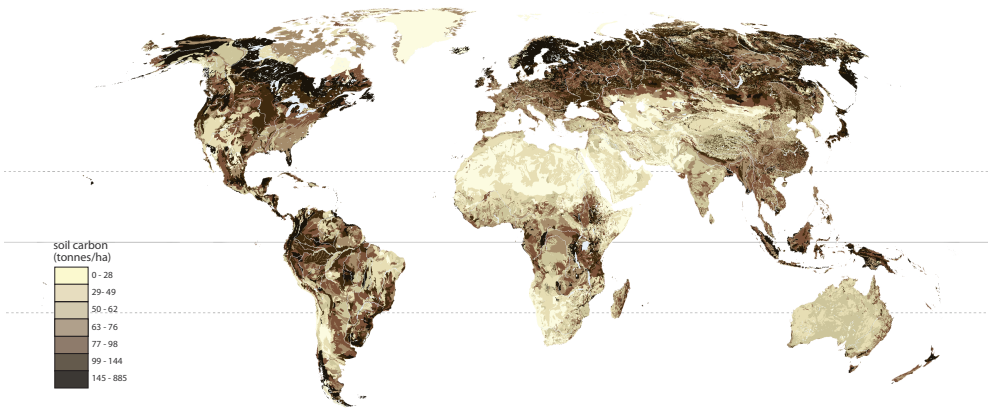
The Benefits of Soil Carbon

Managing soils for multiple economic, societal and environmental benefits

A new focus at all levels of governance of soils for multiple benefits, by managing soil carbon effectively, would constitute a significant step towards meeting the need for ecosystem services to support the world population in 2030 and beyond.

DISTRIBUTION OF SOC



Why is soil carbon (SOC) important?

Traditionally the value of soils has mainly been associated with agricultural production, but soils are of great importance for many other benefits to humankind. Soil carbon is a vital element in healthy soils.

The world's soils store more than three times as much carbon as the atmosphere, with most in the Earth's humid regions; ~2 200 Gt SOC in the top 1 metre. Thus SOC is a critical element in regulating the global climate.

Soil carbon also influences ecosystem nutrient and water cycles; aids physical stability; supports biodiversity; helps regulate flooding and ground water recharge; and increases ecosystem resilience to climate change.

In many cases multiple economic, societal and environmental benefits can be obtained on the same land through effective management of soil carbon.

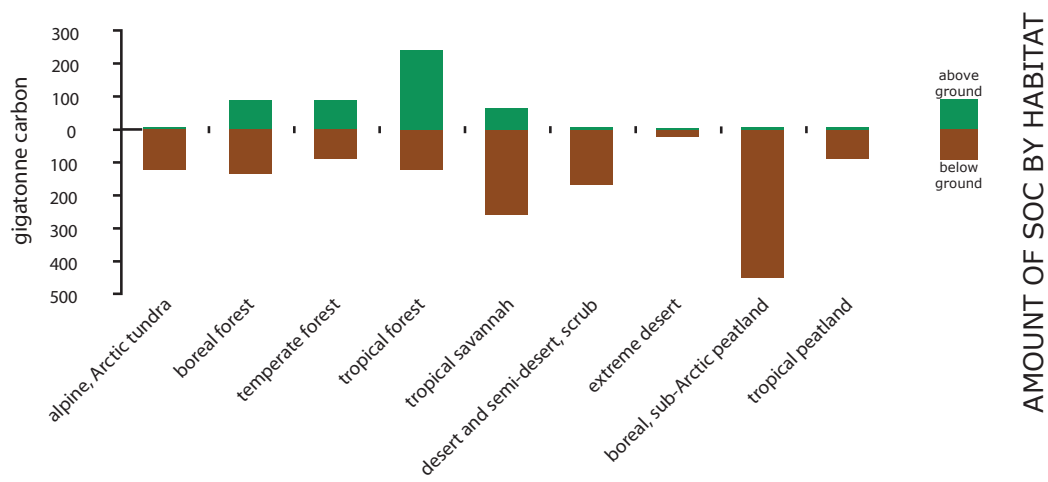
Status of global soil carbon

Since the 1800s, more than 60% of the world's soil carbon has been lost due to land use change, management and environmental degradation (Houghton, 1995).

Losses of SOC in the past 25 years have resulted in declines in agricultural productivity and other services (Bai et al. 2008).

Soil erosion, linked to SOC losses, now occurs at rates more than 100 times the rate of natural soil formation (Montgomery 2007).

Carbon-rich peat is disappearing at rates 20 times greater than it can accumulate (Joosten 2009).



CHANGES IN SOC

Maintaining and enhancing Soil carbon levels

Strategies to protect and restore soil carbon could make a major contribution to mitigating climate change while enhancing degraded ecosystem goods and services. Two primary strategies are:

1. Reduce and stop losses of existing SOC.

This is vital for peats and other carbon rich soils, degraded habitats and extensive drylands / savannahs. Many options are available to reduce losses through land use change or management e.g. livestock densities, habitat restoration, planning limits.

2. Increase soil carbon levels.

In managed soils, this can be achieved by appropriate crop selection, livestock numbers, nutrient management, irrigation, reduced tillage, cover crops and re-use of animal manures, biochar and wastes. All can be encouraged as part of sustainable production systems. In degraded ecosystems, there is significant potential to increase SOC through land use change and/or management.

The way forward - managing soil carbon for multiple benefits

In the face of further land use intensification to meet global demands for food, water and energy (Foresight 2011), managing soils so that carbon stocks are sustained and even enhanced is of crucial importance if we are to meet near-term challenges and conserve this valuable resource for future generations.

The challenge is to develop and implement planning processes, policies and incentive mechanisms that balance pressures on the soil from contrasting and (at times) conflicting demands for food, fibre and fuel crops, climate regulation, water, biodiversity conservation, living space and other benefits.

Various global efforts and policy options exist that could be augmented to achieve wider benefits from SOC by encouraging active management of soil carbon to enhance and restore ecosystem goods and services.

Such mechanisms could include:

- Land use planning to protect vulnerable soils from land uses that lead to SOC losses.
- Protect soils that are important soil carbon stores, such as peatlands and tundra, as an alternative to other uses such as agricultural or forestry expansion.
- Limit and remove drainage of carbon-rich soils.
- Promote management to protect and enhance SOC as an essential element of good soil and environmental quality.
- Financial incentives such as payments for carbon storage, flood control, improvement of water quality, conservation of soil biodiversity and other ecosystem services.
- Advisory systems for land managers that address the full range of ecosystem services that are supported by soils, and the management of soil carbon.

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