

# Soil - a key resource for the EU



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■ **EU law does not address all the threats in a comprehensive way and not all Member States have specific legislation on soil protection.**

■ **Since 2006, the European Commission has been working on a global cross-EU strategy to deal with all aspects of soil protection, while taking into account the variety of situations in each country.**

■ **Adopting the proposed Soil Framework Directive will be a cornerstone in the implementation of a proper soil protection policy in the European Union.**

*soil*



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environment

## Fact 1: Soil is a key, largely non-renewable and very complex natural resource and yet it is increasingly damaged by certain human practices.

Soil is the fragile, friable layer of the earth's crust that covers the continents, between the surface and the bedrock. It is formed by mineral particles, organic matter, water, air and living organisms. It is the interface between earth, air and water and hosts most of the biosphere.

Soil provides us with food, biomass and raw materials, serves as a platform for human activities, our landscape and our heritage and plays a central role as a habitat and gene pool. It stores, filters and transforms substances such as water, nutrients and carbon.

Soil structure is very complex and variable — in Europe alone, 10 000 different types of soil (categorised into over 320 major soil types) have been identified (see box on key facts). Damage to soil structure has repercussions on other environmental media and ecosystems.

It takes centuries to build up a mere centimetre of soil but, if mistreated, soil can be blown or washed away in a few seasons. And yet, soil degradation is accelerating. This is in part a natural phenomenon but some soil degradation processes are exacerbated by all kinds of unsustainable human uses. Inappropriate agricultural practices accelerate water and wind erosion and the decline in organic matter, leading to a loss of soil fertility. Too many animals grazing in a given area and inappropriate use of heavy machinery make the soil too compact. Inappropriate irrigation leads to an increase in salt. Intensive land use, population growth



and tourism increase the risk of landslides in areas with steep slopes, lots of rain and abandoned land. Earlier industrialisation and poor management practices have left a legacy of thousands of contaminated sites throughout Europe. Some 9 % of the area of the EU is covered with roads or concrete, disrupting gas, water and energy flows and leading to irreversible loss of fertile soil. The cost of soil degradation in the EU is estimated at some EUR 38 billion each year.

Several of these threats are exacerbated by the effects of climate change, which causes increases in temperature and extreme weather events. If some of these threats are combined, they may ultimately lead to desertification.

## Key facts you should know about soil

1. Soil makes up the outermost layer of our planet and is formed from rocks and decaying plants and animals.
2. Soil has varying amounts of organic matter (resulting from the decomposition of living organisms), minerals and nutrients.
3. It helps clean the water we drink and the air that we breathe — for free!
4. An average soil sample is 45 % minerals, 25 % water, 25 % air and 5 % organic matter. Different-sized mineral particles, such as sand, silt and clay, give soil its texture.
5. Topsoil is the most productive soil layer.
6. Ten tonnes of topsoil spread evenly over a hectare is only as thick as a one Euro coin.
7. Natural processes can take more than 500 years to form two centimetres of topsoil.
8. In some cases, five tonnes of animal life can live in one hectare of soil.
9. Fungi and bacteria help break down organic matter in the soil.
10. Earthworms digest organic matter, recycle nutrients and make the surface soil richer.
11. Roots loosen the soil, allowing oxygen to penetrate. This benefits animals living in the soil. They also hold soil together and help prevent erosion.
12. A fully functioning soil reduces the risk of floods and protects underground water supplies by neutralising or filtering out potential pollutants and storing as much as 3 750 tonnes of water per hectare.
13. Soil scientists have identified over 10 000 different types of soil in Europe.
14. Soils worldwide contain 1 550 billion tonnes of organic carbon (to be compared with an atmospheric carbon pool of 760 billion tonnes and 560 billion tonnes of carbon in living organisms and plants).
15. Soil captures about 20 % of the world's manmade carbon dioxide emissions.

## Fact 2: EU law does not address all the threats in a comprehensive way and not all Member States have specific legislation on soil protection.

In addition to environment policy (e.g. air and water), different EU policies contribute to soil protection, especially agricultural policy which links farmers' eligibility for agricultural subsidies to the respect of certain environmental conditions. Agriculture can have positive effects on the state of soil. For instance, land management practices such as organic and integrated farming or extensive agricultural practices in mountain areas can maintain and enhance organic matter in the soil and prevent erosion and landslides.

However, the provisions in favour of soil protection are spread across many policy areas, and are usually designed to safeguard other environmental media or to promote other objectives. They do not therefore constitute a coherent soil protection policy. This patchy and incoherent approach is not preventing further soil degradation across the EU.

At Member State level, approaches to soil protection vary from one country to another. Some have dedicated legislation on soil protection but, even then, often covering only one specific threat, such as soil contamination.

## Fact 3: Since 2006, the European Commission has been working on a global cross-EU strategy to deal with all aspects of soil protection while taking into account the variety of situations in each country.

The European Commission adopted the Soil Thematic Strategy on 22 September 2006 after a thorough development process involving a broad range of stakeholders — experts from public administrations, agricultural, industrial, environmental and consumer organisations, science and research institutes, the European Environment Agency, the Joint Research Centre and other Commission services, and many other Europe-wide associations.

The strategy tackles the full range of threats and creates a common framework to protect soil. Its objective is to halt and reverse the process of degradation, ensure that EU soils stay healthy for future generations and remain capable of supporting the ecosystems on which our economic activities and our well-being depend.

It is based on four pillars: dedicated legislation in the form of a Soil Framework Directive, integration of soil protection aspects in other sectoral policies, development of the knowledge-base through studies and research projects, and raising public awareness about the role that soil plays in the economy and the ecosystem.

While the interinstitutional negotiations on the Soil Framework Directive are not advancing as quickly as one could have hoped (see Fact 4), the European Commission has been working on the implementation of the other pillars of the strategy. It has, for example, proposed a strengthening of soil provisions for preventing soil and groundwater pollution by industrial installations in the context of the review of the Integrated Pollution Prevention and Control (IPPC) Directive. It has published reports on the link between soil and climate change (see box) and on the role played by soil biodiversity in organic matter recycling and soil fertility as well as in contributing to water filtration. A number of public events and publications have supported raising the profile of soil protection not only among the public at large but also in national, regional and local administrations.

## Soil and climate change

Soils contain around twice the amount of carbon in the atmosphere and three times the amount to be found in vegetation. Europe's soils are an enormous carbon reservoir, containing around 75 billion tonnes. Around 20% of this carbon is sequestered in peat bogs mainly in countries in the northern part of Europe. Soil plays a huge role in climate change, because even a tiny loss of 0.1% of carbon emitted into the atmosphere from European soils is the equivalent to the carbon emission of 100 million extra cars on our roads – an increase of about half of the existing car fleet. Conversely, at today's prices, an increase in soil carbon of the same small amount would be worth some €200 million.

Land use significantly affects soil carbon stocks. Most soils in Europe are accumulating carbon: soils under grassland and forest act as sinks, sequestering up to 100 million tonnes of carbon per year, although soils under arable land act as net emitters, releasing between 10 and 40 million tonnes of carbon per year.

Carbon is lost from soils when grasslands, managed forest lands or native ecosystems are converted to croplands, a process that is slowly reversed when cropland is converted back.

Soil management practices have a considerable impact on carbon stocks.

Agricultural practices can be improved to minimise carbon losses, at the level of the crop and the crop residues, and by ensuring that soils are protected against water and rain with a permanent vegetation cover, less intrusive ploughing techniques, including the use of heavy machinery on the land. Such practices could sequester between 50 and 100 million tonnes of carbon annually in European soils.

Soil is not the only beneficiary of the strategy. Other environmental media such as water, air and nature will also be improved as a result. Land users will benefit from a soil which can better perform the economic functions they expect and the environment in general will benefit from the ecological services that a healthy soil provides.

## Fact 4: The Soil Framework Directive will be a cornerstone in the implementation of a proper soil protection policy in the European Union.

The proposed Soil Framework Directive will be the first legislative instrument at EU level specifically dedicated to the protection of soil and its functions from an unsustainable use. Member States will be required to identify areas where erosion, organic matter decline, compaction, salinisation, acidification and landslides exceed certain unacceptable levels and will have to establish programmes of measures to improve the situation. Measures will be decided by the Member States themselves and could vary according to the severity of the degradation processes, local conditions and socioeconomic considerations.

As far as contamination is concerned, Member States will have to identify the locations of contaminated sites in their national territory and establish a remediation strategy on how to deal with them and in which timeframe. The proposal also addresses the prevention of diffuse contamination by requiring Member States to limit the introduction of dangerous substances into the soil.

Recognising that sealing (i.e. the covering of soil with impermeable materials like cement or asphalt) is an increasing threat to soil functions, the proposal requires Member States to limit sealing, for instance by rehabilitating brownfield sites, so that fertile agricultural land is preserved for future generations.

The European Economic and Social Committee as well as the Committee of the Regions have given a globally favourable opinion on the legislative proposal. The European Parliament has adopted its first reading in November 2007. However, to become a European law, the proposal has to be adopted by the Council too. Currently there is a minority of Member States in the Council which, for different reasons, do not support the Soil Framework Directive. The European Commission continues working to reach a satisfactory agreement to prevent further soil degradation in the EU.

### Further reading

**Soil Atlas of Europe:** more than 20 years of collaboration between European soil scientists has resulted in the publication by the European Commission of the first ever Soil Atlas of Europe — a reference work for EU citizens and decision-makers: [http://eusoiils.jrc.ec.europa.eu/projects/soil\\_atlas/index.html](http://eusoiils.jrc.ec.europa.eu/projects/soil_atlas/index.html)

**CLIMSOIL Report:** a group of European scientists was asked to assess the contribution soils can make to climate change mitigation and the effect of climate change on soil productivity and organic matter depletion. The results are presented in this comprehensive report finalised in December 2008 and available at: [http://ec.europa.eu/environment/soil/review\\_en.htm](http://ec.europa.eu/environment/soil/review_en.htm)

**European Atlas of Soil Biodiversity:** as a contribution to the 2010 International Year of Biological Biodiversity, the European Commission has published an informative and colourful atlas about the life under our feet: [http://eusoiils.jrc.ec.europa.eu/library/maps/biodiversity\\_atlas/index.html](http://eusoiils.jrc.ec.europa.eu/library/maps/biodiversity_atlas/index.html)

**The factory of life – Why soil biodiversity is so important:** it is a brochure for the general public highlighting the characteristics and role of the organisms which live in the soil. It is available in English, French, German, Italian, Polish and Spanish at: [http://ec.europa.eu/environment/soil/factory\\_life.htm](http://ec.europa.eu/environment/soil/factory_life.htm)

Scientific data and information regarding soils at European level are available at: <http://eusoiils.jrc.ec.europa.eu/>

The full text of the strategy and other information are available at: <http://ec.europa.eu/environment/soil/index.htm>

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