

POSITION OF THE SOIL PROTECTION COMMISSION AT THE GERMAN ENVIRONMENT AGENCY (KBU)

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Soil Protection in Europe – A Crucial Step for Germany

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Soil protection Commission at the German Environment Agency

The Soil Protection Commission at the German Environment Agency (KBU) brings together the key stakeholders in soil protection from the fields of science, practice and administration across the board. The KBU supports the German Environment Agency by providing expert advice. It deals not only with soil protection issues, but also with related areas.

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A Boost from Brussels! Directive (EU) 2025/2360 on soil monitoring and soil resilience (subtitle: Soil Monitoring Law) was adopted in late 2025. All Member States must transpose this Directive into national law by December 2028, followed by its practical implementation. The Directive relies on the definition of target values for healthy soils, which are to be achieved across all areas by 2050. Even for Germany, which already possesses extensive long-term experience in soil protection, further development is necessary. For instance, the EU Directive places greater emphasis — than current German soil protection law — on the role of soils in climate protection (particularly as carbon sinks), in climate change adaptation (specifically as water storage), and as habitats for soil organisms as part of global biodiversity. Furthermore, concrete sustainable target values and operational trigger values for assessing soil conditions with regard to the most significant soil threats are either specified or are to be established by the Member States. The implementation of the Directive presents numerous technical and legal challenges. In particular, the cooperation between the Federal Government and the Länder (states) regarding the enforcement of the Directive's requirements must be clarified. Against this backdrop, the Soil Protection Commission at the Federal Environment Agency intends to provide recommendations for the successful implementation of the Directive in Germany.

Introduction

With the adoption of European Directive 2025/2360 on soil monitoring and soil resilience, the protection of soils is now legally anchored at the European level (Panagos et al. 2025). The new Directive acknowledges the fact that soils perform a vital cross-border function for food security, the global carbon budget, the landscape water balance, the safeguarding of biological diversity, and human health. The objectives of the Directive are to create a framework for regularly repeated soil examinations and assessments, which helps to maintain soil health in the EU and to continuously improve it where necessary (EU 2025). The aim is to create healthy soils by 2050 that provide ecological, social, and economic ecosystem services in order to prevent or mitigate the effects of climate change and the loss of biological diversity, and to increase resilience against natural disasters and enhance food security (EU 2025).

It should be emphasised that the Directive addresses all major potential soil threats: soil sealing and soil loss, soil contamination, salinisation (which is currently less relevant in Germany), soil erosion, soil compaction, deterioration of water retention and infiltration, excessive nutrient levels, acidification, loss of organic soil carbon and soil biodiversity and its associated ecosystem services. In order to protect European soils from these threats in the long term, a meticulous survey of soil conditions must be carried out and repeated at regular intervals (monitoring).

Germany, which already possesses decades of experience in long-term soil observation and soil condition surveys of forest and agricultural soils, will benefit from the now-initiated EU-wide recording and assessment of soil conditions. Firstly, EU Member States that do not yet have soil monitoring systems must now establish them. Secondly, the Directive ensures a minimum level of comparability regarding the selection of sampling sites and the examination programme. Finally, the obligations in the Directive go beyond the scope of some existing monitoring programmes in Germany. This primarily concerns soil threats like subsoil compaction, changes in the soil water balance, and the loss of soil biodiversity, as well as the input of organic pollutants that have previously been ignored or insufficiently considered. From a soil protection perspective, the inclusion of these threats is justified and important. Of particular significance is that, upon implementation of the Directive, so-called sustainable target values and operational trigger values will gradually be established for all forms of soil degradation. The non-binding target values mark a healthy state, while the operational trigger values indicate the need for competent authorities to initiate advisory services and measures to restore soil health in the affected areas.

Recommendations of the Soil Protection Commission

The KBU (Soil Protection Commission) has made the following recommendations for the implementation of the Directive in Germany, with the goal of a soil monitoring system that is effective, practicable, and future-proof in conjunction with the new European requirements.

1. Technical implementation of the Directive and interaction with existing monitoring programmes in Germany

- For the implementation of the Directive, the more complex soil monitoring programmes that have been running for decades (particularly the long-term soil observations of the Länder (states) and the soil condition surveys for agriculture and forestry) should be maintained in their existence and methodological approach and, if necessary, supplemented by further parameters and sampling sites (particularly unused or semi-natural areas and urban areas).

- The prescribed data collection according to the EU Monitoring Directive alone is not well-suited for a causal analysis of soil threats in Germany. In particular, information on site management, groundwater (where relevant), and further site characteristics (e. g., the parent material of soil formation) is lacking. For systemic understanding and causal analysis, the more complex long-term soil observation programmes of the Länder (states), soil condition surveys, and long-term field trials must therefore be continued in full in Germany.

- Owners and possessors of land selected for sampling, as well as authorities responsible for nature conservation access rights, should be encouraged to support the sampling process. To achieve this, the anonymity of owners and possessors must be absolutely guaranteed, which should be regulated by law or contract. Sampling at selected sites is conducted to obtain a representative picture of the soil condition in a specific soil region given a certain land use, and to derive funding programmes and measures for the general improvement of soil conditions or to track the success of measures already taken.

- Where possible, inter-laboratory comparison tests (ring tests) on the analysis parameters should be carried out across Europe, involving all laboratories actively or potentially working under the Directive, to ensure data comparability and methodological stability for repeated examinations over time.

- The inclusion of a mandatory method for recording and categorising soil biodiversity in the Directive is welcomed. However, the question arises whether the proposed parameter (“DNA metabarcoding”) is methodologically stable and thus suitable for permanent soil monitoring. Methods using freely accessible extraction procedures should be established as soon as possible (VBBio/BSA 2025). Additionally, DNA metabarcoding is an analytical method and not a target variable, suggesting that significant questions remain regarding the recording and assessment of soil biological (specifically soil microbiological) diversity. Many questions remain unanswered: At which taxonomic level should diversity be recorded (e. g. species, families, genera), which diversity indices should be used, how can ecological specialisations and qualities be incorporated, and how can aspects such as rarity and specific functions of species be considered? The Soil Protection Commission explicitly welcomes the implementation of the nationwide baseline survey BioDive4Soil in Germany, which addresses these questions.

2. Assessment of monitoring results

- The assessment of physical, chemical, and biological soil conditions and their changes with regard to a good soil condition ("soil health") is technically complex and generally resists simple approaches. For some of the descriptors chosen in the Directive, there are different assessment concepts and procedures (e. g. regarding dry bulk density in the subsoil), and further technical discussion is required. However, comprehensive data collection offers the opportunity to use geostatistical approaches to categorise values and identify trends after repeated examination. Target and trigger values can be refined based on the newly acquired extensive datasets and, if necessary, adapted regionally (or at the Member State level) (cf. background values for heavy metals at the state level, LABO 2017). Functional justifications for threshold values and target values can be developed through the interplay with more intensive monitoring programmes, field trials, or other scientific studies.

- When assessing soil condition in terms of soil health, the production function of the soil (in terms of sustainable soil use) must be considered alongside ecological soil functions. A soil assessment can then be carried out as part of a comparison of sites within the same land-use category and comparable site conditions.

- Germany should technically and politically push forward the development and adoption of target and trigger values, as these will represent the technical standard for a healthy soil and the necessity for action.

3. Organisational implementation of the Directive in Germany and implications for the amendment of federal soil protection legislation

- The implementation of the Directive must be supported by sufficient personnel and financial resources at the federal, state, and municipal levels to fund the increased number of sites compared to existing programmes, the additional soil parameters to be examined, and the expanded scope of analysis (particularly regarding PFAS and new plant protection products). Synergies with existing monitoring programmes in Germany should be considered, but components of existing programmes that go beyond the Directive must be urgently continued if, for example, they are required to investigate the causes of soil degradation.

- The implementation of the Directive in Germany also provides the opportunity to carry out the urgently needed amendment of the Federal Soil Protection Act (BBodSchG 1998). The Act, which has previously focused on reactive soil protection, must urgently be supplemented with requirements for precautionary soil protection, thereby legally anchoring, among other things, the soil's important contribution to climate change adaptation (Umweltbundesamt 2026).

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