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LEGISLATIVE ACTS AND OTHER INSTRUMENTS

Subject:	Position of the Council at first reading with a view to the adoption of a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Soil Monitoring and Resilience (Soil Monitoring Law) – Adopted by the Council on 29 September 2025

DIRECTIVE (EU) 2025/…
OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of …

on Soil Monitoring and Resilience
(Soil Monitoring Law)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 192(1) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee[1],

Having regard to the opinion of the Committee of the Regions[2],

Acting in accordance with the ordinary legislative procedure[3],

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1 OJ C, C/2024/887, 6.2.2024, ELI: http://data.europa.eu/eli/C/2024/887/oj.
2 OJ C, C/2024/5371, 17.9.2024, ELI: http://data.europa.eu/eli/C/2024/5371/oj.
3 Position of the European Parliament of 10 April 2024 (OJ C, C/2025/1312, 13.3.2025, ELI: http://data.europa.eu/eli/C/2025/1312/oj) and position of the Council at first reading of 29 September 2025 (not yet published in the Official Journal). Position of the European Parliament of … (not yet published in the Official Journal).

Whereas:

(1) Soil is a vital, limited resource and is considered non-renewable and irreplaceable on a human time-scale. It is crucial for the economy, the environment and society in general.

(2) Healthy soils are soils that are in good chemical, biological and physical condition and which can therefore provide ecosystem services vital to humans and the environment, such as safe, nutritious and sufficient food, biomass, clean water, nutrients cycling, carbon storage and a habitat for biodiversity. Soils are also essential for ensuring food security. However, it is estimated that 60 to 70 % of the soils in the Union are degraded and continue to deteriorate.

(3) Soils also provide other services, such as acting as a physical platform for infrastructure and for human activities, being a source of raw materials, or constituting an archive of geological, geomorphological and archaeological heritage. Not all of those other services need a functional ecosystem to be provided. Such other services are often the most prevalent uses of soil, causing a significant loss of vital ecosystem services. It is therefore important to find a balance between those two types of services provided by soils.

(4) Soil degradation affects ecosystem services provided by soils, with a negative impact on human health and on the environment. Soil degradation can cover aspects related to physical degradation, such as soil sealing and soil artificialisation in general, soil erosion, soil compaction and reduction of soil water retention and infiltration, and aspects related to chemical or biological degradation, such as excess and depletion of nutrients, acidification, salinisation and soil contamination, and loss of soil organic carbon, soil biodiversity and soil biological activity.

(5) Soil degradation costs the Union tens of billions of euro every year. Soil health impacts the provision of ecosystem services that have a significant economic return. The improvement of soil health makes sound economic sense and could significantly increase the price and value of land in the Union. Moreover, it can take hundreds of years to produce just 1 centimetre of topsoil, while the degradation process and complete loss of soil can occur rapidly.

(6) The Commission communication of 11 December 2019 entitled ‘The European Green Deal’ set out an ambitious roadmap to transform the Union into a fair and prosperous society, with a modern, resource-efficient and competitive economy, aiming to protect, conserve and enhance the Union’s natural capital and to protect the health and well-being of its citizens. As part of the European Green Deal, the Commission adopted the EU Biodiversity Strategy for 2030 set out in its communication of 20 May 2020 entitled ‘EU Biodiversity Strategy for 2030, Bringing nature back into our lives’, the Farm to Fork Strategy set out in its communication of 20 May 2020 entitled ‘A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system’, the Zero Pollution Action Plan set out in its communication of 12 May 2021 entitled ‘Pathway to a Healthy Planet for All EU Action Plan: Towards Zero Pollution for Air, Water and Soil’, the EU Climate Adaptation Strategy set out in its communication of 24 February 2021 entitled ‘Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change’ and the EU Soil Strategy for 2030 set out in its communication of 17 November 2021 entitled ‘EU Soil Strategy for 2030: Reaping the benefits of healthy soils for people, food, nature and climate’.

(7) The Union is committed to the United Nations 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs). Healthy soils contribute directly to the achievement of several SDGs, in particular SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG 6 (clean water and sanitation), SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production), SDG 13 (climate action) and SDG 15 (life on land). SDG 15.3 aims to combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world by 2030.

(8) The Union and its Member States, as parties to the United Nations Convention on Biological Diversity[4], approved by Council Decision 93/626/EEC[5], agreed at the 15th Conference of the Parties to that Convention on the 'Kunming-Montreal Global Biodiversity Framework', which comprises several action-oriented global targets for 2030 of relevance for soil health. According to that Framework, nature's contributions to people, including soil health, should be restored, maintained and enhanced.

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4 OJ L 309, 13.12.1993, p. 3.

5 Council Decision 93/626/EC of 25 October 1993 concerning the conclusion of the Convention on Biological Diversity (OJ L 309, 13.12.1993, p. 1, ELI: http://data.europa.eu/eli/dec/1993/626/oj).

(9) The Union and its Member States, as parties to the United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa (UNCCD)[6], approved by Council Decision 98/216/EC[7], have committed to combatting desertification and mitigating the effects of drought in affected countries. Fourteen Member States, namely Bulgaria, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Hungary, Malta, Portugal, Romania, Slovenia and Slovakia, have declared themselves as countries affected by desertification under the UNCCD.

(10) In the context of the United Nations Framework Convention on Climate Change (UNFCCC), approved by Council Decision 94/69/EC[8], land and soil are considered simultaneously as a source and a sink of carbon. The Union and its Member States, as parties to the UNFCCC, have committed to promote sustainable management, conservation and enhancement of carbon sinks and reservoirs.

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6 OJ L 83, 19.3.1998, p. 3, ELI: http://data.europa.eu/eli/convention/1998/216/oj.

7 Council Decision 98/216/EC of 9 March 1998 on the conclusion, on behalf of the European Community, of the United Nations Convention to combat desertification in countries seriously affected by drought and/or desertification, particularly in Africa (OJ L 83, 19.3.1998, p. 1, ELI: http://data.europa.eu/eli/dec/1998/216/oj).

8 Council Decision 94/69/EC of 15 December 1993 concerning the conclusion of the United Nations Framework Convention on Climate Change (OJ L 33, 7.2.1994, p. 11, ELI: http://data.europa.eu/eli/dec/1994/69(1)/oj).

(11) The EU Biodiversity Strategy for 2030 states that it is essential to step up efforts to protect soil fertility, reduce soil erosion and increase soil organic matter by adopting sustainable soil management practices. It also states that significant progress is needed on identifying contaminated soil sites, restoring degraded soils, defining the conditions for good ecological status of soils, introducing restoration objectives and improving the monitoring of soil health.

(12) The EU Soil Strategy for 2030 sets the long-term vision that, by 2050, all Union soil ecosystems are in a healthy condition and are thus more resilient. As a key solution, healthy soils contribute to addressing the Union's goals of achieving climate neutrality and becoming resilient in relation to climate change, developing a clean and circular economy, including a clean and circular bioeconomy, reversing biodiversity loss, safeguarding human health, halting desertification and reversing land degradation.

(13) Funding is vital to enable a transition to healthy soils. The 2021-2027 Multiannual Financial Framework, laid down in Council Regulation (EU, Euratom) 2020/2093[9], presents several funding opportunities available for the protection, sustainable management and regeneration of soils. 'A Soil Deal for Europe' is one of the five EU missions of Horizon Europe – the Framework Programme for Research and Innovation, established by Regulation (EU) 2021/695 of the European Parliament and of the Council[10], and is specifically dedicated to promoting soil health. The EU Mission 'A Soil Deal for Europe' is a key instrument for the implementation of this Directive, and aims to lead the transition to healthy soils through funding an ambitious research and innovation programme, establishing a network of 100 living labs and lighthouses in rural and urban areas, advancing the development of a harmonised soil monitoring framework and increasing awareness of the importance of soil.

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[9] Council Regulation (EU, Euratom) 2020/2093 of 17 December 2020 laying down the multiannual financial framework for the years 2021 to 2027 (OJ L 433 I, 22.12.2020, p. 11, ELI: http://data.europa.eu/eli/reg/2020/2093/oj).

[10] Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013 (OJ L 170, 12.5.2021, p. 1, ELI: http://data.europa.eu/eli/reg/2021/695/oj).

Other Union policies and programmes that present objectives contributing to healthy soils are the common agricultural policy (CAP), the cohesion policy funds, the Programme for Environment and Climate Action (LIFE), established by Regulation (EU) 2021/783 of the European Parliament and of the Council[11], Horizon Europe, the Technical Support Instrument, established by Regulation (EU) 2021/240 of the European Parliament and of the Council[12], the Recovery and Resilience Facility, established by Regulation (EU) 2021/241 of the European Parliament and of the Council[13], and the InvestEU Programme, established by Regulation (EU) 2021/523 of the European Parliament and of the Council[14]. As the goal to have all soils within the Union in a healthy condition is of common interest, there is a need to increase the mobilisation of resources, including private capital, and to enhance cooperation with relevant financial institutions, such as the European Investment Bank, in order to support soil health and soil resilience.

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11 Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021 establishing a Programme for the Environment and Climate Action (LIFE), and repealing Regulation (EU) No 1293/2013 (OJ L 172, 17.5.2021, p. 53, ELI: http://data.europa.eu/eli/reg/2021/783/oj).

12 Regulation (EU) 2021/240 of the European Parliament and of the Council of 10 February 2021 establishing a Technical Support Instrument (OJ L 57, 18.2.2021, p. 1, ELI: http://data.europa.eu/eli/reg/2021/240/oj).

13 Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility (OJ L 57, 18.2.2021, p. 17, ELI: http://data.europa.eu/eli/reg/2021/241/oj).

14 Regulation (EU) 2021/523 of the European Parliament and of the Council of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017 (OJ L 107, 26.3.2021, p. 30, ELI: http://data.europa.eu/eli/reg/2021/523/oj).

(14) In the EU Soil Strategy for 2030, the Commission announced it would submit a legislative proposal on soil health to enable the objectives of that strategy to be met and good soil health to be achieved across the Union by 2050. In its resolution of 28 April 2021 on soil protection, the European Parliament emphasised the importance of protecting soil and promoting healthy soils in the Union, bearing in mind that soil degradation continues, despite the limited and uneven action being taken in some Member States. The European Parliament called on the Commission to design a Union-wide common legal framework, with full respect for the subsidiarity principle, for the protection and sustainable use of soil, addressing all major soil threats. Significantly, the European Parliament underlined the risks stemming from the absence of a level playing field for the functioning of the internal market and the strong potential of a common legal framework on soil to stimulate fair competition in the private sector, develop innovative solutions and know-how, and strengthen the export of technologies outside the Union.

(15) In its conclusions of 23 October 2020, the Council supported the Commission in stepping up efforts to better protect soils and soil biodiversity, as a non-renewable resource of vital importance.

(16) Regulation (EU) 2021/1119 of the European Parliament and of the Council[15] sets out a binding objective of climate neutrality in the Union by 2050 and negative emissions thereafter, to be achieved by prioritising swift and predictable emission reductions and, at the same time, enhancing removals by natural sinks. Sustainable soil management results in increased carbon sequestration and in most cases in co-benefits for ecosystems and biodiversity. The Commission communication of 15 December 2021 entitled 'Sustainable Carbon Cycles' underlined the need for clear and transparent identification of the activities that unambiguously remove carbon from the atmosphere, such as the development of a Union framework for the certification of carbon removals from natural ecosystems, including soils. Moreover, Regulation (EU) 2018/841 of the European Parliament and of the Council[16] not only makes soil carbon central to the achievement of targets on the pathway to a climate neutral Europe, but also calls for Member States to prepare a system for the monitoring of soil carbon stocks, using, inter alia, the land use/cover area frame statistical survey (LUCAS) datasets.

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15 Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') (OJ L 243, 9.7.2021, p. 1, ELI: http://data.europa.eu/eli/reg/2021/1119/oj).

16 Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (OJ L 156, 19.6.2018, p. 1, ELI: http://data.europa.eu/eli/reg/2018/841/oj).

(17) The EU Climate Adaptation Strategy underlined that using nature-based solutions inland, including the restoration of the sponge-like function of soils, will boost the supply of clean and fresh water, reduce the impacts of flooding and alleviate the impacts of droughts. It is important to maximise the capacity of soils to retain and purify water and reduce pollution.

(18) The Zero Pollution Action Plan sets out the vision for 2050 that air, water and soil pollution is reduced to levels no longer considered harmful to health and natural ecosystems and that respect the boundaries our planet can cope with, thus creating a toxic-free environment.

(19) The Commission communication of 23 March 2022 entitled 'Safeguarding food security and reinforcing the resilience of food systems' stressed that food sustainability is fundamental for food security. Healthy soils make the Union food system more resilient by providing the basis for nutritious and sufficient food.

(20) It is necessary to set measures for Union-wide harmonised monitoring and assessment of, and support for, soil health and soil resilience and tackling contaminated sites, in order to achieve healthy soils by 2050, to maintain soils in a healthy condition and meet the Union's objectives on climate and biodiversity, to prevent and respond to droughts and natural disasters, to protect human health and to ensure food security and safety.

(21) Soils host more than 25 % of all biodiversity and are the second-largest carbon pool on the planet. On account of their ability to capture and store carbon, healthy soils contribute to the achievement of the Union's objectives on climate change. Soil biodiversity encompasses micro-organisms, including bacteria, fungi, protists and nematodes, as well as larger organisms, such as earthworms and insects, and plant roots, which collectively contribute to the ecological and functional diversity of soil ecosystems. Healthy soils also provide a favourable habitat for organisms to thrive and are crucial for enhancing biodiversity and the stability of related ecosystems. Biodiversity below and above ground are intimately connected and interact through mutualistic relationships between species, such as mycorrhizal fungi that connect plant roots. Therefore, the importance of collection and analysis of information on the presence of soil bacteria and fungi should be recognised and serve as a foundation for the potential future expansion of biodiversity monitoring.

(22) Soil organic matter is crucial for the provision of soil ecosystem services and functions, as it reduces soil degradation such as erosion and compaction, while increasing the buffering, water-holding, infiltration and cation exchange capacity of the soil. Soil organic matter can improve not only the structural stability of soils, but also the development of biomass, including an increase in crop yields. Additionally, soil organic matter positively affects soil biodiversity and can increase the amount of carbon sequestered in soils and therefore the soil organic carbon stocks, thereby contributing to climate change mitigation and adaptation.

(23) Floods, wildfires and extreme weather events are natural disaster risks of the highest concern across Europe. The concerns regarding droughts and water scarcity are rapidly increasing across the Union. In 2020, 24 Member States considered droughts and water scarcity to be key emerging or climate-related disaster risks, compared to only 11 Member States in 2015. Healthy soils are instrumental in ensuring resilience in relation to droughts and natural disasters. Practices that enhance water retention and nutrient availability in soils, soil structure, soil biodiversity and carbon sequestration increase the resilience of ecosystems, plants and crops to withstand and recover from drought, natural disasters, heatwaves and extreme weather events, which will become more frequent in the future due to climate change. In contrast, without proper soil management, drought and natural disasters cause soil degradation and make soils unhealthy. Improvement of soil health helps to mitigate the fatalities and the economic losses associated with climate-related extremes, which amounted to more than 182 000 casualties and approximately 560 billion EUR in the Union between 1980 and 2021.

(24) Soil health contributes directly to human health and well-being. Healthy soils provide safe and nutritious food, and have the ability to filter contaminants, hence preserving drinking water quality. Soil contamination can harm human health through ingestion, inhalation or dermal contact. Human exposure to the healthy soil microbial community is beneficial in relation to developing the immune system and resistance to certain diseases and allergies. Healthy soils support the growth of trees, flowers and grasses, and create green infrastructure that offers aesthetic value, well-being and an improved quality of life.

(25) Soil degradation impacts soil fertility, yields, pest resistance and nutritional food quality. Since 95 % of our food is directly or indirectly produced on soils and the global population continues to increase, it is crucial that this finite natural resource remains healthy to ensure food security in the long-term and secure the productivity and profitability of Union agriculture. It is important to maintain or enhance soil health and contribute to the sustainability and resilience of the food system.

(26) The aspirational long-term objective of this Directive is to achieve healthy soils by 2050. In light of the limited knowledge regarding the condition of soils and regarding the effectiveness and costs of the measures to regenerate their health, this Directive focuses on establishing a soil monitoring framework and assessing the situation of soils throughout the Union. This Directive also includes support for soil health and soil resilience as well as for assessment and management of the risks of contaminated sites. However, it does not impose an obligation on Member States to achieve healthy soils by 2050 or set intermediate targets. As soon as the results of the first assessment of soil health and related trend analysis are available, the Commission should take stock of the progress made towards achieving the objectives of this Directive and assess the need for its possible amendment.

(27) Addressing the pressures on soils and supporting soil health and soil resilience require that certain characteristics be taken into account, namely the variety of soil types, the specific local and climatic conditions and the land use or the land cover. It is therefore appropriate that Member States establish soil districts and soil units. Soil districts should reflect the administrative territories under the responsibility of appropriate governance structures and cover one or several entire soil units. In turn, soil units should reflect a certain degree of homogeneity of those characteristics, for the monitoring and assessment of soil health across all of the territory of Member States. Soil units should be under the responsibility of those governance structures, enabling Member States to ensure that the monitoring and assessment of soil health are properly undertaken, and that the support for soil health and soil resilience complies with the requirements under this Directive.

(28) To design the sampling survey for soil monitoring, Member States will need to take into account their soil districts and soil units. In order to ensure a sufficient level of harmonisation between Member States, a set of minimum criteria for defining soil units should be established at Union level, taking into account at least the soil type and land use. For that purpose, the map of the Soil Regions of the European Union and Adjacent Countries 1:5 000 000, published by the Federal Institute of Geosciences and Natural Resources (BGR), in partnership with the Joint Research Centre (JRC), could be used. That map builds on soil types as defined in the World Reference Base for Soil Resources, coordinated by the International Union of Soil Sciences, as well as on fully comparable and harmonised basic data at the continental level, such as on climate, topography, relief, geology and vegetation. As regards land use, the categories defined in Regulation (EU) 2018/841 and the Intergovernmental Panel on Climate Change (IPCC) Guidelines serve as a harmonised basis for land use reporting. Therefore, in order to delineate soil units, Member States should take into account at least the soil districts, as well as the soil regions and the land use categories. On account of spatial variability in soil properties and land use, a soil unit can consist of non-adjacent areas. In addition, climatic and environmental conditions can be taken into account when delineating soil units. More detailed or updated information at the Union, national or subnational level could be used, where available. When establishing their soil units, Member States can draw on additional available data on climate, environmental zones or river basins. In this context, the Alterra Report 2281 on 'Descriptions of the European Environmental Zones and Strata' of January 2012 is especially relevant as it provides datasets on generic classification of environmental stratification of Europe, aggregated into environmental zones, which can be used for the establishment of soil units by Member States.

(29) In order to ensure appropriate governance in relation to soils, Member States should be required to designate the competent authorities responsible at an appropriate level for carrying out the obligations provided for in this Directive, including one or more competent authorities for each soil district. Member States should be allowed to designate any additional competent authority at the appropriate level, including at national or subnational level. It is essential that Member States provide the Commission with up-to-date information on the designated competent authorities.

(30) Member States should be allowed to designate the appropriate competent authority for carrying out the obligations provided for in this Directive at military sites. In addition, data and information pertaining to military sites should not be disclosed, if their disclosure adversely affects public security or national defence. Therefore, Member States should be permitted not to make accessible to the public data and information the disclosure of which would adversely affect public security or national defence, even through a digital soil health data portal to be established by the Commission and the European Environment Agency (EEA) or a national register of potentially contaminated sites and contaminated sites to be set up by Member States and should be permitted not to report such data and information to the Commission and the EEA.

(31) In order to have a common understanding of healthy soil condition, it is necessary to establish a minimum common set of measurable criteria which, if not respected, would lead to a critical loss in the capacity of soil to function as a vital living system and to provide ecosystem services. Such criteria should reflect and be based on the existing level of soil science.

(32) In order to describe soil degradation, it is necessary to establish common soil descriptors that can be measured or estimated. Even if there is significant variability between soil types, climatic conditions and land uses, current scientific knowledge allows the setting of criteria at Union level for some of those soil descriptors. However, Member States should be able to adapt the criteria for some of those soil descriptors based on specific national or local conditions and to define the criteria for other soil descriptors for which common criteria at Union level cannot be established at this stage. For those soil descriptors for which clear criteria that would distinguish between healthy and unhealthy soil condition cannot be established at this stage, their monitoring and assessment will facilitate the possible development of such criteria in the future.

(33) The criteria for healthy soil condition of the soil descriptors should be divided into non-binding sustainable target values and operational trigger values. The non-binding sustainable target values should reflect the aspirational long-term objective of this Directive and do not create an obligation to act. Those non-binding sustainable target values should reflect, based on the current scientific knowledge, the ideal situation whereby the capacity of soils to provide ecosystem services will not decrease and no significant harm will be caused to human health or the environment. However, bearing in mind the need for efficiency and the limited resources available, and in order to reflect local conditions, operational trigger values set by Member States are needed. Those operational trigger values should set in motion support to achieve soil health and soil resilience. For each aspect of soil degradation, one or several proportional and feasible operational trigger values should be set. Setting the trigger values at national level will ensure that local conditions and practices, soil use and current policies can be fully taken into account. Member States could decide to set the operational trigger value for one or more aspects of soil degradation at the same level as the non-binding sustainable target value for those aspects of soil degradation. The Commission should support Member States in setting the non-binding sustainable target values and operational trigger values.

(34) Some soils have special characteristics, either because they are atypical by nature and constitute rare habitats for biodiversity or unique landscapes or because they have been heavily modified by humans and could contain tangible traces of human history. Those characteristics should be taken into account in the context of the definition of healthy soils and the requirements to achieve healthy soil condition.

(35) Similarly to its aspirational long-term objective to achieve healthy soils by 2050, and with a view to contributing to the objectives of the EU Soil Strategy for 2030 and in particular to the 'No Net Land Take' objective, this Directive also aims to adopt a stepwise approach to the issue of land take. To contribute to that long-term objective, it is important to assess the various processes of land take, and aim to reduce and mitigate their impact on soil health and ecosystem services. This Directive thus aims to set up a soil monitoring framework for the more visible aspects of land take, namely soil sealing and soil removal, using tools already available at Union level through services delivered under the Copernicus component of the Union Space Programme, established by Regulation (EU) 2021/696 of the European Parliament and of the Council[17] ('Copernicus services'), optionally complemented with national remote-sensing data and national inventories. The aim is to have a common understanding with regard to soil sealing and soil removal and to initiate preliminary reflections at national level, based on sound data.

(36) Without prejudice to Member States' competence for taxation and to the 'polluter pays' principle, the provisions concerning soil health monitoring under Chapter II of this Directive should not be understood as creating any financial burden on landowners and land managers other than Member States and the competent authorities.

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[17] Regulation (EU) 2021/696 of the European Parliament and of the Council of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU (OJ L 170, 12.5.2021, p. 69, ELI: http://data.europa.eu/eli/reg/2021/696/oj).

(37) Soil is a limited resource subject to ever-growing competition for different uses. Land take is a process which causes a modification of land use and of the characteristics of the soil. It can be seen as an overarching concept that can be subdivided into multiple aspects. The first aspect of land take is a change from natural and semi-natural land uses towards settlement areas. The second aspect of land take is soil artificialisation caused by the durable alteration of the soil components and soil characteristics, resulting in a loss of the capacity of soils to provide ecosystem services. Soil artificialisation can be further divided into three main processes, namely soil sealing, soil removal and other types of soil artificialisation. Soil sealing equates to a covering of the soils with artificial materials, which are completely or partially impermeable. Buildings are an example of impermeable soil sealing. Train tracks built with permeable materials are a type of partially impermeable soil sealing. Roads, waste disposal grounds and dumping grounds could be considered as other examples of soil sealing. Soil removal is a temporary or long-term removal of the surface layer of the soil and sometimes of the subsoil in an area. It occurs, for example during construction works, open-pit mining or quarrying. There are other, less visible, types of soil artificialisation such as the intentional stabilisation and compaction of soil, the modification of layers of soil or subsoil with the inclusion of artificial materials or the partial covering of soil with composite materials. The most visible and impactful subtypes of soil artificialisation, namely soil sealing and soil removal, are the easiest to monitor, especially through remote sensing and machine learning. Therefore, soil sealing and soil removal should be monitored together with their effects on soil's capacity to provide ecosystem services.

(38) Among the land take aspects, the growth of settlement areas is a process often driven by economic development needs, which entails a land use change from natural and semi-natural areas, including protected forests, natural grasslands, peatlands, agricultural and forestry land, gardens and parks, to settlement areas, for example as part of urban development. Settlement areas, as described in Regulation (EU) 2018/841, include all developed land, namely residential, transportation, commercial and production infrastructure of any size, unless they are already included under other land use categories. Settlement areas also include soils, herbaceous perennial vegetation such as turf grass and garden plants, and trees in rural settlements, homestead gardens and urban areas. In particular, land take of agricultural land for the settlements often impacts the function of the soil as regards food provision. Such changes of land use are often a precursor to some other aspects of land take, in particular to soil sealing, and it is important to monitor such changes in order to anticipate at least part of the process of soil sealing. It is also important to note that settlements are not always fully sealed. On the contrary, a significant number of urban areas still have large amounts of soils that are not sealed, and for some urban areas that amount is more than 50 % of their surface. That indicator related to that aspect of land take alone is therefore not sufficient to fully monitor the issue of land take as a whole, as it does not differentiate between sealed soils and unsealed soils, and it renders the green areas within settlement areas invisible, making their monitoring and sustainable management more difficult.

(39) Soils in settlement areas that are not sealed, and in densely populated urban areas in particular, are as important to monitor and manage sustainably as any other soils, as they still provide ecosystem services that are vital in maintaining a good quality of life within urban areas. A wide array of environmental issues are present and concentrated in a comparatively small surface area, in densely populated urban areas. Those issues could include, among others, a higher rate of contaminated sites due to past industrial activities, a higher risk of flooding because of soil sealing, a higher prevalence of heat islands and more limited access to green areas essential for mental and physical well-being. Soil ecosystem services provided by healthy soils in urban areas can have a very strong positive impact on a great number of people by addressing those specific issues, and their importance should not be understated. Urban green spaces, both public and private, also contribute to the 'blue-green network' and to biodiversity, and are a key element of other environmental policies. This is also in line with Article 8 of Regulation (EU) 2024/1991 of the European Parliament and of the Council[18] on the restoration of urban ecosystems, which reflects the need for Member States to maintain and increase the surface area of urban green spaces.

[18] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (OJ L, 2024/1991, 29.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1991/oj).

(40) Soil sealing and soil removal, as part of the soil artificialisation aspect of land take, are different from the growth of settlements, as they do not necessarily constitute land use change, but rather a concrete and measurable change in the soil cover and soil characteristics. Soil sealing and soil removal can cause the loss, often irreversibly, of the capacity of soils to provide vital ecosystem services, such as provision of food and biomass, water and nutrients cycling, a basis for biodiversity or carbon storage. Sealed soil also exposes human settlements to higher flood peaks and more intense heat island effects.

(41) With regard to renewable energy sites, Member States can qualify the soil as sealed, as soil in an area that underwent soil removal or as soil that was not sealed or as soil in an area that did not undergo soil removal, depending on the type of construction. For example, solar parks could either be considered as soil sealing or not, depending on what is done with the soil at the base of the solar panels. If the soil can still sustain an ecosystem sufficiently, then solar parks are not considered soil sealing. That assessment should be made based on the impact on the soil, regardless of the purpose or appearance of the relevant construction. Inventories of areas with such types of constructions, where information on what is done with the soil at the base of such types of constructions is available, can be intersected with remote-sensing maps of soil sealing to qualify those areas as soils that are not sealed.

(42) Mitigation is essential as regards the impact of soil sealing and soil removal in general. Therefore, it is appropriate to lay down certain principles to mitigate the impact of soil sealing and soil removal, by adopting an effort-based approach taking into account a large set of good practices aimed at minimising and offsetting the loss of soil's capacity to provide ecosystem services. Those principles should be based on the land take hierarchy of the EU Soil Strategy for 2030, taking into account different conditions and geographical and administrative circumstances in Member States. The provisions of this Directive concerning land take do not impose new permitting procedures and should not prevent permitting of activities, including for projects of overriding public interest, and should not impinge on the spatial planning decisions that fall under the competence of national, regional or local authorities. Those principles could cover a wide array of practices such as minimising soil sealing, de-sealing and reconstructing previously sealed soils, rational densification of urbanised areas while safeguarding green spaces, including urban green spaces, and natural terrains, revitalisation of brownfields, privileging time-limited land take and performing land rehabilitation upon the termination of the land take. In order to mitigate the impact of soil sealing and soil removal as sustainably as possible, the offsetting measures, depending on the ecosystem service to be offset, might need to be geographically as close as possible to the source of the loss of the ecosystem service. Indeed, a consequence of the wrong application of those principles can be the displacement of green and high-value ecosystem areas and services far away from the areas with sealed soils, with a complete concentration of soil sealing and soil removal in the affected areas.

(43) The soil health assessment based on the monitoring network should be accurate, while at the same time keeping the costs of such monitoring at a reasonable level. It is therefore appropriate to lay down criteria for sampling points that are representative of the soil units reflecting a certain degree of homogeneity of soil condition under different soil types, climatic conditions and land use. It is also appropriate to consider the specific situation of the Union's outermost regions, as listed in Article 349 of the Treaty on the Functioning of the European Union (TFEU), which justifies providing for specific measures to support those regions. Therefore, Member States should be able to adapt, when necessary, the obligations relating to monitoring and assessment of soil health to their outermost regions' specific characteristics. The grid of sampling points should be determined by using geostatistical methods, be based on soil units and be sufficiently dense to provide an estimation of the area of degraded soils throughout the territory of Member States, with a margin of error of not more than 5 % at the soil unit level. That value is commonly considered to provide a statistically sound estimation and reasonable assurance that the objective concerned has been achieved. The design of the sampling survey for soil monitoring should be based on the best available information on distribution of soil properties, such as information resulting from previous national or subnational surveys, relevant measurements carried out by soil managers and measurements conducted under Union and international law or specific programmes, such as the LUCAS soil campaigns or the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). Without prejudice to obligations laid down under this Directive for the management of contaminated sites, data obtained from sampling points taken during soil investigations at contaminated sites can be used for the assessment of criteria for healthy soil condition.

(44) Soil archives store a representative subset of soil samples, which makes it possible to use one sample for various purposes, including research, thus reducing the long-term costs of in-situ monitoring. In addition, soil archives make it possible to re-evaluate soil samples taken in the past in the context of the present for the purposes of an improved understanding of long-term soil change, or for other research purposes, including medical research. The Commission, including services such as the JRC, and the Member States should ensure that a representative subset of soil samples is well preserved in physical archives and remains available for further research and innovation. Where Member States undertake such archiving, a representative subset of soil samples should be stored in dedicated soil archives at least for two monitoring cycles. It should be possible for Member States to decide to transfer a representative subset of their soil samples to the Commission's dedicated soil archive.

(45) The Commission should assist and support Member States, at their request, in monitoring their soil health by continuing to carry out and enhancing regular in-situ soil sampling and related soil measurements (LUCAS soil) as part of the LUCAS carried out in accordance with Regulation (EC) No 223/2009 of the European Parliament and of the Council[19]. For that purpose, and subject to the agreement of Member States, LUCAS is to be enhanced and upgraded to fully align it with the specific quality requirements to be met for the purposes of this Directive. In order to alleviate the administrative and financial burden, Member States should be allowed to take into account the soil health data collected under LUCAS. Those soil health data should be made available to Member States in a timely manner. The Member States thus supported should make the necessary legal arrangements to ensure that the Commission can carry out such in-situ soil sampling, including on privately owned land, and in compliance with applicable Union or national law.

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[19] Regulation (EC) No 223/2009 of the European Parliament and of the Council of 11 March 2009 on European statistics and repealing Regulation (EC, Euratom) No 1101/2008 of the European Parliament and of the Council on the transmission of data subject to statistical confidentiality to the Statistical Office of the European Communities, Council Regulation (EC) No 322/97 on Community Statistics, and Council Decision 89/382/EEC, Euratom establishing a Committee on the Statistical Programmes of the European Communities (OJ L 87, 31.3.2009, p. 164, ELI: http://data.europa.eu/eli/reg/2009/223/oj).

(46) The Commission is developing remote-sensing services in the context of Copernicus as a user-driven programme established by Regulation (EU) 2021/696, thereby also supporting Member States. In order to increase the timeliness and effectiveness of soil health monitoring, Member States should, where relevant, use remote-sensing data, including outputs from the Copernicus services, for the monitoring of relevant soil descriptors and soil sealing and soil removal indicators, and, if relevant, the assessment of soil health. The Commission and the EEA should support exploring possibilities with regard to, and developing, soil remote-sensing products, to assist Member States in monitoring the relevant soil descriptors and soil sealing and soil removal indicators.

(47) Building on and upgrading the existing EU Soil Observatory, the Commission should establish a digital soil health data portal that should be compatible with the EU Data Strategy, set out in its communication of 19 February 2020 entitled 'A European strategy for data', and with the EU data spaces. The digital soil health data portal should be a hub providing access to soil data coming from various sources, in an aggregated form at the soil unit level or at a more detailed level if relevant, provided that it is not possible to identify the individual values or the location of the underlying georeferenced samples. That portal should primarily include all the data collected by the Member States and the Commission as required by this Directive.

The processing and accessing of those data, including for scientific purposes, should comply with relevant Union law, such as Directives 2003/4/EC[20], 2007/2/EC[21], (EU) 2019/1024[22] of the European Parliament and of the Council as well as Regulation (EU) 2023/2854 of the European Parliament and of the Council[23] and Regulation (EC) No 223/2009. Furthermore, Member States should be able to review soil health data and to request correction of any errors, before such data are made public through the digital soil health data portal. In addition, it should be possible to integrate in the portal, on a voluntary basis, other relevant soil data collected by Member States or any other party, and in particular data resulting from projects under Horizon Europe and the EU Mission 'A Soil Deal for Europe', provided that those data meet certain requirements as regards format and specifications. Those requirements should be specified by the Commission by way of implementing acts.

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[20] Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC (OJ L 41, 14.2.2003, p. 26, ELI: http://data.europa.eu/eli/dir/2003/4/oj).

[21] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (OJ L 108, 25.4.2007, p. 1, ELI: http://data.europa.eu/eli/dir/2007/2/oj).

[22] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (OJ L 172, 26.6.2019, p. 56, ELI: http://data.europa.eu/eli/dir/2019/1024/oj).

[23] Regulation (EU) 2023/2854 of the European Parliament and of the Council of 13 December 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act) (OJ L, 2023/2854, 22.12.2023, ELI: http://data.europa.eu/eli/reg/2023/2854/oj).

(48) It is also necessary to improve the harmonisation of soil monitoring systems used in the Member States and exploit the synergies between Union and national monitoring systems in order to have more comparable data across the Union. It is very important to ensure the quality and comparability of soil measurements through the application of quality management system practices by the laboratories involved. To minimise the administrative burden for the laboratories, a Member State could consider it sufficient for laboratories to have one accreditation for any of the methodologies for determining the values of soil descriptors. Laboratories, or parties contracted by laboratories, performing the soil measurements should apply quality management system practices in accordance with EN ISO/IEC-17025. Equivalent quality management standards at Union or international level could be used, and, where relevant, synergies with the quality management system of ICP Forests could be sought.

(49) It is important to use methodologies for soil testing that are certified by internationally recognised bodies, such as the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN), as well as acknowledged by the global research community, provided that such methodologies are available. It is also possible to use for soil testing other equivalent methodologies, namely analytical procedures that determine the same parameter or descriptor and are proven to produce identical results within the margin of their repeatability coefficient (0,95). Certification of any equivalent methodologies should also be obtained from internationally recognised bodies, such as the ISO and the CEN, and such equivalent methodologies should be acknowledged by the global research community.

(50) In order to ensure that soils are protected from contamination by substances that have the potential to cause significant risks to human health and to contaminate surrounding air, surface waters, groundwater and subsequently oceans, policy mechanisms to detect and assess such substances of concern should be established. In that regard, an approach that allows monitoring and analysis of such substances or groups of substances via an indicative list, similar to the approach used for surface water and groundwater, should be developed regarding soil contamination. The substances or groups of substances to be placed on such indicative list should include substances posing a significant risk to soil health and soil resilience, human health or the environment, and substances for which the information available indicates that they could pose a significant risk to, or via, soil, and for which the available monitoring data are insufficient. There should be no upper limit on the number of the substances or groups of substances to be included in the indicative list of soil contaminants for the purposes of monitoring and analysis.

(51) It is necessary to gather data on the presence of soil contaminants that could pose a risk to human health and the environment, including pesticides, their metabolites, per- and polyfluoroalkyl substances (PFAS) and other emerging soil contaminants. This Directive should therefore provide a framework to include such contaminants in an indicative list of soil contaminants for which more soil monitoring data are needed to address the risk to human health and the environment. In order to limit monitoring costs, Member States should be allowed to perform measurements on a limited number of sampling points for those contaminants. The Commission could provide support to Member States by measuring a selection of the soil contaminants from the indicative list of soil contaminants in LUCAS.

(52) Microplastics and nanoplastics are substances that can pose a risk to soil health and also to essential activities such as agricultural production. Their presence in soils can have implications for soil fertility, thereby compromising the health and healthy development of crops. It is therefore essential that this Directive allow the inclusion of microplastics and nanoplastics in the monitoring of soil contaminants.

(53) In order to make the widest possible use of soil health data generated by the monitoring carried out under this Directive, Member States should be required to facilitate the access to such data to the public, in an aggregated form at the soil unit level or at a more detailed level if relevant, provided that it is not possible to identify the individual values or the location of the underlying georeferenced samples. The confidential data collected by the Commission or by Member States to produce European statistics should be protected in accordance with the rules and measures of Regulation (EC) No 223/2009, in order to gain and maintain the confidence of the parties responsible for providing that information. Where the Commission or Member States produce soil health statistics, they should ensure that confidential data respect the principles of Regulation (EC) No 223/2009. Moreover, in order to protect data ownership, it is important that the Commission, the EEA or the Member States only disclose data with the consent of the data owner. In addition, Member States should communicate soil health data and the results of the soil health assessments to relevant stakeholders such as farmers, foresters, landowners and local authorities. It is important that prospective land buyers and tenants receive, in accordance with national law and upon their request, the soil health data and the results of the soil health assessments. Furthermore, soil health data made available pursuant to this Directive can be used for monitoring of soil-related aspects carried out under other Union law, where relevant.

(54) The results of the soil health assessments carried out under this Directive will inform the process of identifying the specific practices needed to manage soil sustainably and thus the support that Member States should provide to increase soil health and soil resilience. Without prejudice to the obligations stemming from other Union and national law, the provisions of this Directive on support for soil health and soil resilience do not impose additional obligations on landowners and land managers. At the same time, soil managers, landowners, land managers and relevant authorities should receive support to improve soil health and soil resilience. That support should take the form of, inter alia: information and advice on practices that improve soil health and soil resilience, taking into consideration the local soil conditions; capacity building; promoting awareness of the benefits of practices that improve soil health and soil resilience; promoting research and innovation; assessing the technical and financial needs; and facilitating access to and uptake of available funding.

(55) Economic instruments, including those under the CAP that provide support to farmers, have a crucial role in maintaining and improving soil health and soil resilience and, to a lesser extent, forest soils. The CAP aims to support soil health through the implementation of conditionality, eco-schemes and rural development measures. Financial support for farmers and foresters that apply practices improving soil health and soil resilience can also be generated by the private sector. For example, voluntary sustainability labels in the food, wood, bio-based and energy industries, established by private stakeholders, can take into account the contributions of farmers and foresters to improve soil health and soil resilience in accordance with this Directive. Such labels could enable food, wood and other biomass producers that follow those practices in their production to reflect them in the value of their products. Additional funding for a network of real-life sites for testing, demonstrating and upscaling of solutions, including on carbon farming, will be provided through the living labs and lighthouses of the EU Mission 'A Soil Deal for Europe'. Without prejudice to the 'polluter pays' principle, support and advice should be provided by Member States to help landowners, land managers and land users affected by actions taken under this Directive, taking into account, in particular, the needs and limited capacities of small and medium-sized enterprises.

(56) Pursuant to Regulation (EU) 2021/2115 of the European Parliament and of the Council[24], Member States are to describe in their CAP strategic plans how the environmental and climate architecture of those plans is intended to contribute to the achievement of, and be consistent with, the long-term national targets set out in, or deriving from, the legislative acts listed in Annex XIII to that Regulation.

(57) Member States should be required to closely monitor the impact of the support for soil health and soil resilience, taking into account new knowledge from research and innovation. Valuable contributions are expected in this respect from the EU Mission 'A Soil Deal for Europe' and, in particular, its living labs and activities to support soil monitoring, soil education and citizen engagement.

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[24] Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013 (OJ L 435, 6.12.2021, p. 1, ELI: http://data.europa.eu/eli/reg/2021/2115/oj).

(58) Soil regeneration brings degraded soils back to a healthy condition. In the context of soil regeneration, the results of the soil health assessments can be taken into account and it is appropriate to adapt regeneration measures to the specific characteristics of the situation, type, use and condition of the soil and the local, climatic and environmental conditions. In the case of areas with soil sealing or soil removal, recovering the capacity of soils to provide ecosystem services requires first reconstructing the soil, with the aim of achieving a level of functioning of the soil and ecosystem services provision which is as close as possible to its natural functioning and its optimal level of ecosystem services provision.

(59) To ensure synergies between the different measures adopted under other Union law that could have an impact on soil health, Member States should ensure that the activities to support soil health and soil resilience are consistent with: the national restoration plans prepared in accordance with Regulation (EU) 2024/1991; the national biodiversity strategies and action plans established in accordance with Article 6 of the United Nations Convention on Biological Diversity; the CAP strategic plans to be drawn up by Member States in accordance with Regulation (EU) 2021/2115; the codes of good agricultural practices and the action programmes for designated vulnerable zones adopted in accordance with Council Directive 91/676/EEC[25]; the conservation measures and prioritised action framework established for Natura 2000 sites in accordance with Council Directive 92/43/EEC[26];

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25 Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (OJ L 375, 31.12.1991, p. 1, ELI: http://data.europa.eu/eli/dir/1991/676/oj).

26 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7, ELI: http://data.europa.eu/eli/dir/1992/43/oj).

the measures for achieving good ecological status and good chemical status of water bodies included in river basin management plans prepared in accordance with Directive 2000/60/EC of the European Parliament and of the Council[27]; the flood risk management measures established in accordance with Directive 2007/60/EC of the European Parliament and of the Council[28]; the drought management plans promoted in the EU Climate Adaptation Strategy; the national action programmes established in accordance with Article 10 of the UNCCD; the targets set out under Regulations (EU) 2018/841 and (EU) 2018/842 of the European Parliament and of the Council[29]; the integrated national energy and climate plans established in accordance with Regulation (EU) 2018/1999 of the European Parliament and of the Council[30]; the national air pollution control programmes prepared under Directive (EU) 2016/2284 of the European Parliament and of the Council[31];

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27 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1, ELI: http://data.europa.eu/eli/dir/2000/60/oj).

28 Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (OJ L 288, 6.11.2007, p. 27, ELI: http://data.europa.eu/eli/dir/2007/60/oj).

29 Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (OJ L 156, 19.6.2018, p. 26, ELI: http://data.europa.eu/eli/reg/2018/842/oj).

30 Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1, ELI: http://data.europa.eu/eli/reg/2018/1999/oj).

31 Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (OJ L 344, 17.12.2016, p. 1, ELI: http://data.europa.eu/eli/dir/2016/2284/oj).

the risk assessments and disaster risk management planning established in accordance with Decision No 1313/2013/EU of the European Parliament and of the Council[32]; the national actions plans adopted in accordance with Article 4 of Directive 2009/128/EC of the European Parliament and of the Council[33] and the environmental impact assessments performed in accordance with Directive 2011/92/EU of the European Parliament and of the Council[34]. Activities supporting soil health and soil resilience should be, as far as possible, integrated within those programmes, codes, action frameworks, targets, plans and measures to the extent that they contribute to the achievement of their objectives. Consequently, relevant indicators and data, such as soil-related result indicators under Regulation (EU) 2021/2115 and statistical data on agricultural input and output reported under Regulation (EU) 2022/2379 of the European Parliament and of the Council[35], should be accessible to the competent authorities in order to cross-reference those data and indicators and thus make it possible to obtain the most accurate possible assessment of the effectiveness of the measures chosen.

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32 Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism (OJ L 347, 20.12.2013, p. 924, ELI: http://data.europa.eu/eli/dec/2013/1313/oj).

33 Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides (OJ L 309, 24.11.2009, p. 71, ELI: http://data.europa.eu/eli/dir/2009/128/oj).

34 Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (OJ L 26, 28.1.2012, p. 1, ELI: http://data.europa.eu/eli/dir/2011/92/oj).

35 Regulation (EU) 2022/2379 of the European Parliament and of the Council of 23 November 2022 on statistics on agricultural input and output, amending Commission Regulation (EC) No 617/2008 and repealing Regulations (EC) No 1165/2008, (EC) No 543/2009 and (EC) No 1185/2009 of the European Parliament and of the Council and Council Directive 96/16/EC (OJ L 315, 7.12.2022, p. 1, ELI: http://data.europa.eu/eli/reg/2022/2379/oj).

(60) Contaminated sites are often the legacy of decades of activities in the Union, such as industrial or military activities, and can lead to risks to human health and the environment now and in the future. It is therefore necessary first to identify and investigate potentially contaminated sites and then, in the event of confirmed contamination, to assess the risks of the contaminated site and take measures to address unacceptable risks. In this context, it is essential to also consider the impact of contaminated sites on environmental media or matrices other than soil, such as groundwater or surface water. Some of those activities, such as the use of underground storage facilities for dangerous substances, might have taken place in the bedrock or the parent material. Where such underground storage facility has leaked, contaminants might have moved into the bedrock or the parent material, and most likely they will not be found in the soil. However, the contaminants could spread and thus have an impact on human health or the environment. Therefore, if such activities are undertaken at potentially contaminated sites, the bedrock or the parent material in the vicinity of the activity will also have to be investigated to verify whether the activity has caused contamination that has an impact on human health or the environment.

(61) Soil investigation needs to determine whether a potentially contaminated site is in fact contaminated, and whether the contamination poses a risk to human health or the environment. This Directive does not require the analysis of soil descriptors other than soil contamination as part of the soil investigation. As land use can change over time, it is important to keep information on contamination accessible to the public. For instance, where a decision has to be taken on a change of land use, it is important to evaluate whether contamination found in a past soil investigation might pose a risk to the envisaged new land use. Therefore, in order to assess whether a potentially contaminated site is in fact contaminated, the risks to human health or the environment linked to the sensitive use of the site also have to be taken into account. Sensitive uses of sites include the use of playgrounds, schools or sites used for childcare, or areas in their vicinity, the use of residential areas or the use by vulnerable populations of other areas. Where a soil investigation proves that a potentially contaminated site is in fact not contaminated, the site should no longer be considered by the Member State as potentially contaminated, unless contamination is suspected based on new evidence.

(62) As the number of potentially contaminated sites and contaminated sites could be very high and the level of risk that a contaminated site poses can vary from very low to very high, it is appropriate to follow a risk-based and stepwise approach for identifying and investigating potentially contaminated sites and for managing contaminated sites. Such approach can enable Member States to prioritise certain sites. By prioritising certain sites, Member States can take into account the potential risk a suspected or confirmed case of contamination poses to human health and the environment, as well as the social or economic context. The evaluation of the potential risk involved in such prioritisation is much more generic than the site-specific risk assessment that is carried out on a contaminated site.

(63) To identify potentially contaminated sites, Member States should collect evidence, including through historical research that explores information on industrial activities, incidents and accidents, using old maps, archives, press articles, environmental permits and notifications by the public or authorities and human biomonitoring or environmental monitoring data from research projects. Member States should set a list of potentially contaminating activities and be able to prioritise certain potentially contaminated sites that are most likely to pose a potential risk to human health or the environment, based on the type of activity, extent of the potential contamination, an indication that there is an immediate risk or other relevant information. As the number of potentially contaminated sites might evolve over time, a first identification of such sites should be completed within a set timeframe, based on the existing evidence, while further identification of such sites should be carried out through a systematic approach.

(64) In order to ensure that soil investigations on potentially contaminated sites are carried out in a timely and effective manner, Member States should, in addition to the obligation to establish the timeframe within which soil investigations should be carried out, be required to identify specific events that trigger such investigations. Such triggering events could include the request for or review of an environmental or building permit or an authorisation required pursuant to Union or national law, soil excavation activities, land use changes, or land or real estate transactions. Soil investigations could follow different stages, such as a preliminary desk study, site-specific historic study to collect information about past industrial activities, incidents or accidents, site visit, preliminary or exploratory investigation, more detailed or descriptive investigation, and field or laboratory testing, and could include a site-specific assessment of the risks the contamination poses to human health and the environment. If contamination is found, the soil investigation should form the basis of the characterisation of the contamination and its environmental context and provide basic information for the site-specific risk assessment and the design of any risk reduction measures that might be necessary. Baseline reports and monitoring measures implemented in accordance with Directive 2010/75/EU of the European Parliament and of the Council[36] could also qualify as soil investigation where appropriate.

[36] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial and livestock rearing emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17, ELI: http://data.europa.eu/eli/dir/2010/75/oj).

(65) Flexibility with regard to the management of contaminated sites is necessary to take account of costs, benefits and local specificities. Member States should therefore at least adopt a risk-based and stepwise approach for identifying and investigating potentially contaminated sites and for managing contaminated sites, taking into account the difference between those two categories and thereby enabling resources to be allocated taking account of the specific environmental, social and economic context. Decisions with regard to the management of contaminated sites, including on the risk-based and stepwise approach, should be taken based on the nature and extent of potential risks to human health, including the exposure to contaminants of vulnerable populations such as pregnant women, persons with disabilities, elderly people and children, and to the environment resulting from exposure to soil contaminants or to contaminants that migrated to the groundwater and, if possible, the cumulative effects on human health, soil ecosystems and associated ecosystem services.

(66) Natural and anthropogenic background levels should be taken into account in the risk assessment as they could also help to set soil remediation or management objectives.

(67) The results of the cost-benefit analysis of undertaking site-specific risk assessment or soil remediation should be positive. For instance, for small-scale contaminated sites, detailed site-specific risk assessment might be more expensive than immediate soil remediation, or the site could be clearly and seriously contaminated in such a way that a detailed site-specific risk assessment would not be necessary for the purposes of taking a decision on soil remediation. In such cases, the number of steps in the risk-based and stepwise approach for identifying and investigating potentially contaminated sites and for managing contaminated sites can be reduced since detailed site-specific risk assessment brings little added value. Member States should lay down the specific methodology for the site-specific risk assessment of contaminated sites. Member States should also determine what constitutes an unacceptable risk from a contaminated site based on scientific knowledge, the precautionary principle, local specificities, and current and planned land use.

(68) In order to reduce to an acceptable level the risks of contaminated sites for human health and the environment, Member States should ensure that adequate risk reduction measures, including soil remediation, are taken. The optimum risk reduction measures should be sustainable and selected through a balanced decision-making process that takes account of the environmental, social and economic impact. The choice of the technique or measure depends on a combination of criteria such as the nature of the contaminants, characteristics of the soil, volume of the contamination, time and space available, budgetary constraints, soil remediation objectives, current and planned land use, and potential to improve soil health. The risk reduction measures should not have a negative impact on the risk assessment and risk management of the catchment areas for abstraction points of water intended for human consumption set out in Article 8 of Directive (EU) 2020/2184 of the European Parliament and of the Council[37]. As soil remediation focuses on removing the risk that soil contamination poses to human health or the environment, it might be the case that soil remediation would not improve other soil descriptors. Certain soil remediation techniques can also negatively impact soil health. Therefore, all the advantages and disadvantages of the remediation techniques should be taken into account. It should be possible to qualify measures taken under other Union law as risk reduction measures under this Directive if those measures effectively reduce risks posed by contaminated sites.

[37] Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (OJ L 435, 23.12.2020, p. 1, ELI: http://data.europa.eu/eli/dir/2020/2184/oj).

(69) The investigation of potentially contaminated sites and the management of contaminated sites should respect the polluter pays, precautionary and proportionality principles. Member States should aim to identify the polluter and should establish a hierarchy of responsibility or decision chain of responsibility, to determine the natural or legal person responsible for bearing the costs of the soil investigation, risk assessment and the risk reduction measures. It should be possible for the Member States to decide to further distinguish between historically and newly contaminated sites and to apply a more stringent approach for contamination caused after a certain date of reference. In the case of contaminated sites for which it is not possible to identify the natural or legal person responsible for the contamination, Member States should be able to use financial instruments and Union funding programmes in order to carry out the obligations regarding soil investigation and soil remediation.

(70) Soil contamination is already regulated under Union law such as Directives 2010/75/EU or 2004/35/CE of the European Parliament and of the Council[38]. The provisions of this Directive are without prejudice to requirements under relevant Union law.

[38] Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (OJ L 143, 30.4.2004, p. 56, ELI: http://data.europa.eu/eli/dir/2004/35/oj).

(71) Soil investigations, risk assessments or risk reduction measures that have been carried out on potentially contaminated sites or contaminated sites prior to … [date of entry into force of this Directive] and which meet the requirements set out in this Directive should be deemed appropriate to meet the requirements set out in this Directive for such sites.

(72) Measures taken pursuant to this Directive should also take account of other Union policy objectives, such as the objectives pursued by Regulation (EU) 2024/1252 of the European Parliament and of the Council[39], namely ensuring a secure and sustainable supply of critical raw materials for the Union's industries.

[39] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).

(73) Transparency is an essential component of soil policy and ensures public accountability and awareness, fair market conditions and that progress can be monitored. Therefore, Member States should set up and maintain a national register of potentially contaminated sites and contaminated sites. Those registers should contain site-specific information and be made publicly accessible in the form of an online georeferenced spatial database. If registers are established at subnational level, Member States should provide for a coordinated national entry point to the different subnational registers with, for example, a centralised national website containing weblinks. The registers should contain the information that is necessary for the public to be informed of the existence of potentially contaminated sites and the management of contaminated sites. Given that the presence of soil contamination on potentially contaminated sites can, by definition, only be suspected, the difference between potentially contaminated sites and contaminated sites should be communicated and clearly explained to the public to avoid raising unnecessary concerns. Registers that exist on … [date of entry into force of this Directive] and that meet the requirements set out in this Directive should be deemed appropriate to meet the requirements set out in this Directive.

(74) Article 19(1), second subparagraph, of the Treaty on European Union (TEU) requires Member States to provide remedies sufficient to ensure effective judicial protection in the fields covered by Union law. In addition, in accordance with the Convention on access to information, public participation in decision- making and access to justice in environmental matters[40] (the 'Aarhus Convention'), approved by the European Community on 17 February 2005 by Council Decision 2005/370/EC[41], members of the public concerned are to have access to justice in order to contribute to the protection of the right to live in an environment which is adequate for personal health and well-being.

[40] OJ L 124, 17.5.2005, p. 4, ELI: http://data.europa.eu/eli/convention/2005/370/oj.

[41] Council Decision 2005/370/EC of 17 February 2005 on the conclusion, on behalf of the European Community, of the Convention on access to information, public participation in decision-making and access to justice in environmental matters (OJ L 124, 17.5.2005, p. 1, ELI: http://data.europa.eu/eli/dec/2005/370/oj).

(75) As clarified by the case law of the Court of Justice of the European Union[42], Member States are not permitted to restrict legal standing to challenge a decision of a public authority to those members of the public concerned who participated in the decision-making procedure which led to the adoption of that decision. In addition, any review procedure should be fair, equitable, timely and not prohibitively expensive, and provide for adequate remedies, including injunctive relief as appropriate. Furthermore, in line with the case law of the Court of Justice of the European Union[43], access to justice is as a minimum to be granted to the public concerned.

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42 Judgment of the Court (First Chamber) of 14 January 2021, *LB and Others* v *College van burgemeester en wethouders van de gemeente Echt-Susteren*, C-826/18, ECLI:EU:C:2021:7, paragraphs 58 and 59.

43 Judgment of the Court (Second Chambre) of 25 July 2008, *Dieter Janecek* v *Freistaat Bayern*, C-237/07, ECLI:EU:C:2008:447, paragraph 42; Judgment of the Court (Second Chamber) of 19 November 2014, *Client Earth* v *the Secretary of State for the Environment*, Food and Rural Affairs, C-404/13, ECLI:EU:C:2014:2382, paragraph 56; Judgment of the Court (First Chamber) of 26 June 2019, *Craeynest and Others*, C-723/17, ECLI:EU:C:2019:533, paragraph 56; Judgment of the Court (Grand Chamber) of 19 December 2019, *Deutsche Umwelthilfe eV* v *Freistaat Bayern*, C-752/18, ECLI:EU:C:2019:1114, paragraph 56.

(76) Directive (EU) 2019/1024 mandates the release of public sector information in free and open formats. The overall objective of Directive (EU) 2019/1024 is to continue the strengthening of the Union's data economy by increasing the amount of interoperable public sector data available for reuse, ensuring fair competition and easy access to public sector information, and enhancing cross-border innovation based on data. The main principle of that Directive is that government data should be open by default and design. Directive 2003/4/EC is aimed at guaranteeing the right of access to environmental information in the Member States in line with the Aarhus Convention. The Aarhus Convention and Directive 2003/4/EC encompass broad obligations related both to making environmental information available upon request and actively disseminating such information. Directive 2003/4/EC provides for a restricted list of exemptions from dissemination or disclosure of environmental information, taking into account the public interest served by the dissemination, in the event that the dissemination or disclosure of the information would adversely affect certain interests. Such interests include: public security or national defence; the confidentiality of commercial or industrial information where such confidentiality is provided for by Union or national law to protect a legitimate economic interest, including the public interest in maintaining statistical confidentiality and tax secrecy; and the confidentiality of personal data or files relating to a natural person where that person has not consented to the disclosure of the information to the public, where such confidentiality is provided for by Union or national law. Directive 2007/2/EC is also of broad scope, covering the sharing of spatial information, including data sets on different environmental topics. It is important that the provisions of this Directive related to access to information and data-sharing arrangements complement Directives (EU) 2019/1024, 2003/4/EC and 2007/2/EC and do not create a separate legal regime. Therefore, the provisions of this Directive regarding information to the public and information on monitoring of implementation should be without prejudice to those Directives.

(77) It is also important that the provisions of this Directive related to data-sharing arrangements enable Member States to reuse existing data infrastructures established pursuant to Directives (EU) 2019/1024 and 2007/2/EC to ensure there is an effective and timely exchange of information. For that purpose, the Member States and the Commission could make use of tools such as REPORTNET managed by the EEA. That approach follows the 'once-only' principle and avoids imposing an additional burden on the Member States to set up a dedicated data infrastructure under this Directive.

(78) In order to ensure the necessary adaptation of the rules on soil health monitoring and management of contaminated sites, the power to adopt acts in accordance with Article 290 TFEU should be delegated to the Commission in respect of amending this Directive to adapt to scientific and technical progress the methodologies for monitoring soil health, the indicative list of risk reduction measures and the phases and principles for the site-specific risk assessment. It is of particular importance that the Commission carry out appropriate consultations during its preparatory work, including at expert level, and that those consultations be conducted in accordance with the principles laid down in the Interinstitutional Agreement of 13 April 2016 on Better Law-Making[44]. In particular, to ensure equal participation in the preparation of delegated acts, the European Parliament and the Council receive all documents at the same time as Member States' experts, and their experts systematically have access to meetings of Commission expert groups dealing with the preparation of delegated acts.

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44 OJ L 123, 12.5.2016, p. 1, ELI: http://data.europa.eu/eli/agree_interinstit/2016/512/oj.

(79) In order to ensure uniform conditions for the implementation of this Directive, implementing powers should be conferred on the Commission in order to set formats or methods for sharing or collecting soil health data and for integrating those data in the digital soil health data portal and to set out the format, structure and detailed arrangements for reporting data and information electronically to the Commission. Those powers should be exercised in accordance with Regulation (EU) No 182/2011 of the European Parliament and the Council[45].

[45] Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by the Member States of the Commission's exercise of implementing powers (OJ L 55, 28.2.2011, p. 13, ELI: http://data.europa.eu/eli/reg/2011/182/oj).

(80) To support Member States in carrying out their obligations under this Directive, the Commission should, in cooperation with the Member States and other stakeholders, where relevant, draw up documents and develop scientific tools, including possible methodologies and procedures that could be applied. Those documents and scientific tools would provide in due time essential information for Member States, while ensuring the flexibility to build on methodologies and procedures already in place. Those documents and scientific tools should be complemented with the necessary assistance and capacity building. The Commission should provide to Member States the necessary capacity building and assistance and support multilateral harmonisation of methods, and thereby eliminate existing data gaps and workflow bottlenecks by sharing expertise. To that end, the Commission should build on existing mechanisms at Union and international level, including the Soil BON initiative, Global Soil Partnership, SOILveR, NICOLE, EUROSOLAN, the EU Mission's 'A Soil Deal for Europe' Mirror Groups and EIONET. The Commission should support cross-border cooperation between Member States to ensure that a harmonised approach to soil monitoring is taken and that there is a level playing field between neighbouring soil districts.

(81) In addition to drawing up documents and developing scientific tools, the Commission should organise regular exchanges of information, experience and best practices on the application of this Directive between Member States and, where relevant, other stakeholders. Such exchanges of information could, in addition, provide the opportunity for the discussion on: communication to the public of the results of the soil health assessments; practices that improve soil resilience; contamination other than anthropogenic point-source contamination; application of the hierarchy of responsibility determining the party or parties responsible for the management of contaminated sites; orphan site management; soil remediation techniques for contaminated sites; identification and evaluation of natural and anthropogenic background levels; approaches for the identification of areas where individual criteria for healthy soil condition are not satisfied; quality management system practices for laboratories; and land take mitigation principles.

(82) By … [90 months from the date of entry into force of this Directive], the Commission should carry out an evidence-based evaluation and, where relevant, a revision of this Directive, on the basis of the results of the soil health assessments. That evaluation should assess in particular the need to set more specific requirements to ensure that the objectives of this Directive are achieved. That evaluation should also assess the need to adapt to scientific and technical progress the definition of healthy soils by adding provisions on certain soil descriptors or criteria for healthy soil condition based on new scientific evidence relating to the protection of soils or on the grounds of a problem specific to a Member State arising from new environmental or climatic circumstances. In accordance with paragraph 22 of the Interinstitutional Agreement of 13 April 2016 on Better Law-Making, that evaluation is to be based on the criteria of efficiency, effectiveness, relevance, coherence and value added and should provide the basis for impact assessments of options for further action.

(83) Coordinated measures by all Member States are necessary to achieve the vision of all soils being healthy by 2050 and to secure the provision of ecosystem services by soils across the Union in the long term. Individual actions of Member States have proven to be insufficient since soil degradation is continuing and even increasing. Since the objectives of this Directive cannot be sufficiently achieved by the Member States but can rather, by reason of the scale and effects of the action, be better achieved at Union level, the Union may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 TEU. In accordance with the principle of proportionality as set out in that Article, this Directive does not go beyond what is necessary in order to achieve those objectives.

(84) The European Data Protection Supervisor was consulted in accordance with Article 42(1) of Regulation (EU) 2018/1725 of the European Parliament and of the Council[46] and delivered an opinion on 11 December 2023.

[46] Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC (OJ L 295, 21.11.2018, p. 39, ELI: http://data.europa.eu/eli/reg/2018/1725/oj).

(85) In accordance with the Joint Political Declaration of 28 September 2011 of Member States and the Commission on explanatory documents[47], Member States have undertaken to accompany, in justified cases, the notification of their transposition measures with one or more documents explaining the relationship between the components of a directive and the corresponding parts of national transposition instruments. With regard to this Directive, the legislator considers the transmission of such documents to be justified,

HAVE ADOPTED THIS DIRECTIVE:

[47] OJ C 369, 17.12.2011, p. 14.

Chapter I
General provisions

Article 1

Objectives and subject matter

1. The objectives of this Directive are to establish a solid and coherent soil monitoring framework for all soils across the Union, to reduce soil contamination to levels no longer considered harmful to human health and the environment, to continuously improve soil health in the Union, to maintain soils in a healthy condition and to prevent and address all aspects of soil degradation, with a view to achieving healthy soils by 2050 so that they can provide multiple ecosystem services on a scale sufficient to meet environmental, societal and economic needs, prevent and mitigate the impacts of climate change and biodiversity loss, and increase resilience against natural disasters and in terms of food security.

2. This Directive lays down a framework for and measures on:

   (a) monitoring and assessment of soil health;

   (b) soil resilience; and

   (c) management of contaminated sites.

Article 2

Scope

This Directive applies to all soils in the territory of the Member States.

Article 3

Definitions

For the purposes of this Directive, the following definitions apply:

(1) ‘soil’ means the top layer of the Earth’s crust, situated between the bedrock or the parent material and the land surface, and which is composed of mineral particles, organic matter, water, air and living organisms;

(2) ‘ecosystem’ means a dynamic complex of plant, animal and micro-organism communities and their non-living environment, interacting as a functional unit;

(3) ‘ecosystem services’ means the direct or indirect contributions of ecosystems to the environmental, economic, social, cultural and other benefits that people derive from those ecosystems;

(4) ‘soil biodiversity’ means the variation in soil life, from genes to communities of organisms, and the ecological complexes of which they are part, that is complexes ranging from soil micro-habitats to landscapes;

(5) ‘soil health’ means the physical, chemical and biological condition of soil, determining its capacity to function as a vital living system and to provide ecosystem services;

(6) ‘soil resilience’ means the ability of soil to preserve its functions and maintain its capacity to provide ecosystem services, and to withstand and recover from disturbances;

(7) ‘soil management practices’ means practices that impact the physical, chemical or biological properties of soil;

(8) ‘soil district’ means a part of the territory of a Member State, which has been delineated by that Member State in accordance with this Directive;

(9) ‘soil unit’ means a spatially discrete area within a soil district resulting from the intersection of sets of spatial data used as factors for statistical homogeneity within that soil district;

(10) ‘soil descriptor’ means a parameter describing a physical, chemical or biological characteristic of soil health;

(11) ‘soil health assessment’ means the evaluation of the health of soil based on the measurement or estimation of the values of soil descriptors;

(12) ‘soil contamination’ means the presence of a substance in soil at a level that may be, directly or indirectly, harmful to human health or the environment;

(13) ‘contaminant’ means a substance liable to cause soil contamination or contamination of bedrock or parent material;

(14) ‘potentially contaminated site’ means a delineated area where soil contamination or contamination of bedrock or parent material caused by anthropogenic point-source activities is suspected based on relevant evidence;

(15) ‘contaminated site’ means a delineated area with confirmed soil contamination or contamination of bedrock or parent material caused by anthropogenic point-source activities;

(16) ‘land’ means the surface of the Earth that is not regularly covered by water bodies;

(17) ‘land cover’ means the physical and biological cover of the surface of the Earth;

(18) ‘soil sealing’ means the covering of soil with completely or partially impermeable material;

(19) ‘sealed soil’ means an area of soil that underwent soil sealing;

(20) ‘soil removal’ means the temporary or long-term total or partial removal of soil in an area;

(21) ‘de-sealing’ means the conversion of sealed soil into soil that is not sealed soil;

(22) ‘transfer function’ means a mathematical rule that enables the value of a measurement performed using a methodology different from a reference methodology to be converted into the value that would be obtained by performing the soil measurement using the reference methodology;

(23) ‘public concerned’ means the public affected or likely to be affected by soil degradation, or having an interest in the decision-making procedures related to the implementation of the obligations under this Directive, including landowners, land managers and land users, as well as non-governmental organisations promoting the protection of human health or the environment and meeting any requirements under national law;

(24) ‘soil regeneration’ means an intentional activity aimed at changing the condition of soil from degraded to healthy;

(25) ‘risk’ means the likelihood of harmful effects to human health or the environment resulting from exposure to soil contamination or to contamination of bedrock or parent material;

(26) ‘soil investigation’ means a process that can be performed in multiple and iterative phases to assess the presence and levels of contaminants in soil, bedrock or parent material and, if relevant, to characterise and determine the extent of a contaminated site;

(27) ‘soil remediation’ means a set of actions that reduce, isolate or immobilise contaminants in soil, bedrock or parent material;

(28) ‘risk reduction measures’ mean measures that aim to reduce the risks that contaminated sites pose to human health and the environment, either by means of soil remediation or modification of the source-pathway-receptor linkage without changing the characteristics of the contamination itself.

Article 4

Soil districts and soil units

1. Member States shall establish, for administrative purposes, one or more soil districts which shall cover their entire territory and be under the responsibility of one or more competent authorities as designated pursuant to Article 5.

2. Member States shall establish soil units which together cover their entire territory, for the purposes of designing monitoring and of reporting with regard to soil health within a given margin of error within the soil unit concerned, taking into account:

   (a) the geographical extent of soil districts as established pursuant to paragraph 1;

   (b) the soil type as defined in the map of the soil regions of the European Union and Adjacent Countries 1: 5 000 000, published by the Federal Institute of Geosciences and Natural Resources (BGR), in partnership with the Joint Research Centre (JRC);

   (c) the land use categories, excluding water bodies, as referred to in Regulation (EU) 2018/841.

3. For the purposes of establishing their soil units, Member States may use, where available at the Union, national or subnational level, updates of data referred to in paragraph 2 or more detailed data equivalent to those data.

Member States may take into account additional spatial data to establish their soil units, such as data concerning the climate, environmental zones as described in the relevant scientific studies or reports, or river basins.

Article 5

Competent authorities

Member States shall designate the competent authorities responsible at an appropriate level for carrying out the obligations provided for in this Directive.

Chapter II

Monitoring and assessment of soil health

Article 6

Monitoring framework for soil health and for soil sealing and soil removal

1. Member States shall establish a monitoring framework (‘soil monitoring framework’) at a level which is appropriate to the soil descriptors and soil sealing and soil removal indicators to ensure that regular, coherent and accurate monitoring of soil health and of soil sealing and soil removal is carried out in accordance with this Article and with Annexes I and II.

The soil monitoring framework shall build on existing monitoring frameworks at national level and Union level including, where appropriate, data from the land use/cover area frame statistical survey (LUCAS).

If necessary, Member States may adapt their soil monitoring framework for their outermost regions in order to take into account the specific characteristics of those regions.

2. Member States shall monitor soil health in each soil unit and soil sealing and soil removal in each soil district.

3. The monitoring framework shall be based on the following:

(a) the soil descriptors and criteria for healthy soil condition referred to in Article 7;

(b) the sampling points to be determined in accordance with Article 9(1);

(c) the soil measurements to be carried out by Member States and, if applicable, by the Commission in accordance with Article 9(3) and (4);

(d) scientifically robust remote-sensing data and products as referred to in paragraph 4 of this Article, if any;

(e) the soil sealing and soil removal indicators referred to in Article 7(1), second subparagraph.

4. The Commission and the European Environment Agency (EEA) shall leverage existing space-based data and products delivered under the Copernicus component of the Union Space Programme, established by Regulation (EU) 2021/696, to explore possibilities with regard to, and develop, in cooperation with Member States, soil remote-sensing products, to provide the Member States with the necessary data on soil sealing and soil removal indicators and to support the Member States in monitoring the relevant soil descriptors.

5. By … [24 months from the date of entry into force of this Directive], the Commission and the EEA shall, on the basis of existing data, establish a digital soil health data portal (the 'digital soil health data portal') to provide access in a georeferenced spatial format to at least the available soil health data, aggregated at the soil unit level or at a more detailed level, resulting from:

   (a) the soil measurements referred to in Article 9(3) and (4);

   (b) the relevant soil remote-sensing data and products referred to in paragraph 4 of this Article.

   The processing and accessing of soil health data referred to in the first subparagraph shall be performed in accordance with relevant Union law.

6. The Commission and the EEA shall ensure that the Member States are given, in a timely and effective manner, the opportunity to review soil health data and to request the correction of any errors, before such data are made public through the digital soil health data portal. The Commission and the EEA shall ensure that such opportunity is also given in relation to any other report to be published in the digital soil health data portal and based on the soil monitoring framework.

7. The digital soil health data portal may provide access to soil health-related data other than the data referred to in paragraph 5 if those soil health-related data were shared or collected in accordance with the formats or methods established by the Commission pursuant to paragraph 9.

8. The digital soil health data portal shall not provide access to data and information the disclosure of which would adversely affect public security or national defence.

9. The Commission shall adopt implementing acts to establish formats or methods for sharing or collecting the data referred to in this Article or for integrating those data in the digital soil health data portal. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 22(2).

Article 7

Soil descriptors, criteria for healthy soil condition, and soil sealing and soil removal indicators

1. When monitoring and assessing soil health, Member States shall apply the soil descriptors listed in Annex I, Parts A, B and C.

   When monitoring soil sealing and soil removal, Member States shall apply the soil sealing and soil removal indicators listed in Annex I, Part D.

2. When assessing soil health, Member States shall use criteria for healthy soil condition consisting of:

   (a) non-binding sustainable target values listed in Annex I, Parts A and B; and

   (b) operational trigger values set in accordance with paragraph 6.

3. Member States shall set a list of organic contaminants for the soil descriptor related to soil contamination referred to in Annex I, Part B. For that purpose, Member States may take into account the indicative list of soil contaminants referred to in Article 8.

4. Member States shall set a list of contaminants for the soil descriptors related to soil contamination referred to in Annex I, Part C, including pesticides, their metabolites and per- and polyfluoroalkyl substances (PFAS), representing the highest risk to human health and the environment, taking into account the indicative list of soil contaminants referred to in Article 8 as well as relevant information on the following, if available:

(a) the toxicity of the soil contaminant;

(b) the persistence and mobility of the soil contaminant;

(c) possible sources and occurrence of the soil contaminant;

(d) quantitative data regarding the production, use, consumption or sales volumes of the substances involved in the Member States concerned;

(e) human biomonitoring data from research projects, and the presence of contaminants in environmental media.

5. Member States shall set the non-binding sustainable target values for the soil descriptors listed in Annex I, Part B, in accordance with the provisions set out in Annex I, Part B, third column.

6. Member States shall set one or more operational trigger values for each soil descriptor listed in Annex I, Parts A and B, reflecting soil degradation levels on the basis of which support for soil health and soil resilience in accordance with Article 11 is needed.

Member States may set the operational trigger value for one or more soil descriptors at the same level as the non-binding sustainable target value for those soil descriptors.

7. Member States may set soil descriptors and soil sealing and soil removal indicators in addition to those that are listed in Annex I.

8. Member States shall inform the Commission when they set or adapt soil descriptors, soil sealing and soil removal indicators or criteria for healthy soil condition in accordance with paragraphs 2 to 8.

Article 8

Indicative list of soil contaminants

1. The Commission shall, in cooperation with the Member States, establish an indicative list containing both soil contaminants with potential significant risks to soil health and soil resilience, human health or the environment and soil contaminants for which data are needed to address the impact of such potential significant risks.

2. The soil contaminants, including pesticides, their metabolites and PFAS, to be included in the indicative list referred to in paragraph 1, shall be selected on the basis of their potential to cause a significant risk to soil health and soil resilience, human health or the environment, of their toxicity and of the exposure to them across the Union.

3. By … [18 months from the date of entry into force of this Directive], the Commission shall establish, in cooperation with Member States, the indicative list of soil contaminants referred to in paragraph 1 and shall update it, where necessary, based on the results of the monitoring and assessment of soil health carried out pursuant to this Chapter and in light of scientific and technical progress.

Article 9

Measurements and methodologies

1. Member States shall determine the number and location of sampling points by applying the methodology set out in Annex II, Part A.

   For the purpose of the first subparagraph, the Commission shall provide Member States with relevant maps of soil descriptors, the initial sampling points and the relevant data linked to sampling points collected under previous LUCAS soil surveys.

2. After determining the number and location of the sampling points and prior to performing the sampling survey, Member States shall notify the Commission of any potential need for support in terms of field sampling and soil analysis as well as any other needs related to the sampling survey.

The Commission shall assess the needs for, and set the appropriate level of, support in coordination with the Member States concerned.

In the event that the Commission provides support under this paragraph, the Member State concerned shall adapt the sampling survey accordingly. The Member State concerned and the Commission shall set out in a written agreement the practical arrangements for such support.

In the event that the Commission provides support for field sampling, the Member State concerned shall ensure that the Commission is able to carry out in-situ soil sampling.

3. Member States and, in the event that the Commission provides support under paragraph 2 in accordance with the written agreement referred to in the third subparagraph of that paragraph, the Commission shall carry out soil measurements by taking soil samples at the sampling points referred to in paragraph 1 and collect, process and analyse data as relevant in order to determine the following:

(a) the values of the soil descriptors listed in Annex I;

(b) where relevant, the values of the additional soil descriptors referred to in Article 7(7).

Member States shall be exempt from taking soil samples from sealed soil and areas that underwent soil removal.

Member States may exclude the areas not at risk of salinisation from the measurement of electrical conductivity referred to in Annex I, Part A, and shall inform the Commission thereof, providing an explanation.

The in-situ soil sampling shall be carried out in accordance with the minimum criteria for the methodology for field sampling surveys set out in Annex II, Part A, point 2.

For the soil contamination descriptors listed in Annex I, Part C, Member States may limit the sampling points to a relevant subset of the total number of sampling points determined in accordance with paragraph 1, first subparagraph, of this Article.

For the descriptor on loss of soil biodiversity listed in Annex I, Part C, Member States shall carry out measurements on at least 5 % of the total number of sampling points determined in accordance with paragraph 1, first subparagraph, of this Article.

4. Provided that the data were collected in the same monitoring cycle during which the sampling survey was performed and according to the methodologies referred to in Annex II, Part A, point 2, and Part B, the soil measurements to be carried out by Member States pursuant to paragraph 3 of this Article may consist of, where relevant, the measurements made by:

(a) Member States in accordance with existing national or subnational soil monitoring networks and soil surveys;

(b) Member States in accordance with Union and international law;

(c) private actors, research organisations and other parties, where available.

For the performance of the first soil measurements as referred to in paragraph 8, the cycle for the collection of the data referred to in the first subparagraph of this paragraph shall, to the extent that those data are available, start on … [12 months before the date of entry into force of this Directive].

5. Member States shall collect, process and analyse data in order to determine the values of the soil sealing and soil removal indicators listed in Annex I, Part D.

6. Member States shall apply the following:

(a) the methodologies for determining or estimating the values of the soil descriptors set out in Annex II, Part B;

(b) the minimum methodological criteria for determining the values of the soil sealing and soil removal indicators set out in Annex II, Part C;

(c) any requirements laid down by the Commission in accordance with paragraph 13 of this Article.

Member States may apply methodologies other than those listed in the first subparagraph, points (a) and (b), of this paragraph, provided that validated transfer functions are available, as required in Annex II, part B, fourth column.

7. Member States shall ensure that laboratories, or parties contracted by laboratories, performing the soil measurements to be carried out by Member States pursuant to paragraph 3 apply quality management system practices in accordance with EN ISO/IEC-17025 or with other equivalent standards accepted at Union or international level, and have access to suitably qualified staff with adequate training and to the infrastructure, equipment and products necessary for carrying out soil measurements.

When assessing compliance with quality management system practices, Member States may deem it sufficient to have one accreditation for any of the methodologies for determining the values of soil descriptors set out in Annex II, Part B.

Member States shall ensure that laboratories, or parties contracted by laboratories, performing the soil measurements to be carried out by Member States pursuant to paragraph 3 demonstrate their competences in relation to analysis of relevant measurands by:

(a) participating in proficiency testing programmes covering the methods of analysis at levels of concentration that are representative of soil monitoring programmes, if available;

(b) analysing reference materials that are representative of collected soil samples that contain appropriate levels of concentration, if available.

Where the Commission carries out soil measurements in accordance with paragraphs 3 and 4, this paragraph shall apply to the Commission.

8. Member States and, in the event that the Commission provides support under paragraph 2, the Commission shall ensure that the first soil measurements are performed by … [60 months from the date of entry into force of this Directive].

9. Member States shall ensure that new soil measurements are performed every six years within one sampling campaign or as part of a continuous sampling scheme during the relevant six-year period.

10. By way of derogation from paragraph 9 of this Article, Member States may decide, before the second and subsequent sampling campaigns, not to carry out new soil measurements for a soil descriptor in part or in all of their territory if it is reasonable and justified to expect, based on data previously collected pursuant to this Article and Articles 6, 7 and 8, and on the use of scientific evidence, including predictive soil models, supported by a statistically significant amount of field data in terms of geographical and temporal coverage, that the value of such soil descriptor has not evolved significantly with respect to the uncertainty of the measurement since the last monitoring cycle. Member States shall notify the Commission of any such decision without undue delay.

The derogation laid down in the first subparagraph shall not apply as regards the carrying out of soil measurements for the same descriptor over two consecutive sampling campaigns.

11. For each monitoring cycle, Member States shall store for at least two monitoring cycles a representative subset of soil samples, in dedicated soil archives. Member States may decide not to store soil samples from their outermost regions.

Where Member States store soil samples in their dedicated soil archives, they shall determine the conditions for access to and use of such soil samples.

Where Member States decide to transfer a representative subset of their soil samples to the Commission's dedicated soil archive, the Commission shall provide for that transfer. The Member States and the Commission shall establish the practical arrangements regarding the shipment of those soil samples and the conditions for their access and use. The Commission shall transmit to the Member States any results coming from further checks of relevant parameters or future analysis of new emerging parameters. The Commission shall store the soil samples in accordance with its archiving protocol.

12. Member States shall ensure that the values of the soil sealing and soil removal indicators are updated at least every three years, based on available information.

13. The Commission is empowered to adopt delegated acts in accordance with Article 21 to amend Annex II, Part B, in order to adapt to scientific and technical progress the reference methodologies referred to therein, in particular where values of soil descriptors can be determined by soil remote-sensing products referred to in Article 6(4).

Article 10

Soil health assessment

1. Member States shall assess the soil health in all their soil districts and associated soil units based on the data collected in the context of the soil monitoring referred to in Articles 6 to 9 for each of the soil descriptors listed in Annex I, Parts A and B.

   Member States shall ensure that soil health assessments are carried out every six years and that the first soil health assessment is carried out by … [72 months from the date of entry into force of this Directive].

2. Soil health shall be assessed with respect to each aspect of soil degradation using the non-binding sustainable target values and the operational trigger values for the related criterion for healthy soil condition set in accordance with Article 7(2), (5) and (6).

3. Member States shall analyse the values for the soil descriptors listed in Annex I, Part C, with a view to identifying whether there is a critical loss of ecosystem services, taking into account the relevant data and available scientific knowledge. Member States shall analyse the values of soil sealing and soil removal indicators listed in Annex I, Part D, with a view to assessing the impact of soil sealing and soil removal on the loss of ecosystem services and on the objectives and targets established under Regulation (EU) 2018/841.

4. Member States may identify improvements for each soil descriptor listed in Annex I, Parts A, B and C.

5. Good condition for a descriptor listed in Annex I, Parts A and B, shall be considered to have been achieved when the non-binding sustainable target value is met. Member States shall set an interval of values for the soil descriptors listed in Annex I, Parts A and B, that constitute moderate condition and poor condition with respect to the operational trigger values. Only the interval of moderate condition may be null.

6. Based on the soil health assessments carried out in accordance with this Article, the competent authorities referred to in Article 5 shall, where relevant in coordination with local, regional and national authorities, identify, in each soil district, the areas where individual criteria for healthy soil condition are not satisfied and for which support for soil health and soil resilience in accordance with Article 11 is needed, and inform the public, on an aggregated level, in accordance with Article 20. The soil health monitoring data, the results of the soil health assessments and the analysis referred to in paragraph 3 of this Article shall inform the development of the programmes, plans, targets and measures listed in Annex III.

7. In order to contribute to improving soil health, the competent authorities referred to in Article 5 shall, where relevant in coordination with local, regional and national authorities, identify, in each soil district, the areas with high potential for improvement of soil health through de-sealing or soil reconstruction. The potential of areas of sealed soil and areas that underwent soil removal shall be assessed based on technical feasibility, cost-efficiency and the achievable level of soil health improvement.

8. In addition to the obligations laid down in Article 20 and in accordance with national law, Member States shall communicate soil health data referred to in Articles 6 to 9 and the results of the soil health assessments carried out in accordance with this Article to the relevant landowners and land managers upon their request, in particular to support the development of the science-based advice referred to in Article 11(1), point (a).

Chapter III
Soil resilience

Article 11

Support for soil health and soil resilience

1. Member States shall encourage and support landowners and land managers as regards improving soil health and soil resilience and facilitate such improvement by landowners and land managers by, inter alia:

   (a) ensuring easy and equal access to impartial and independent science-based advice and to information, training activities and capacity building for soil managers, landowners, land managers and relevant authorities with regard to practices that improve soil health and soil resilience;

(b) promoting awareness of the multiple medium-term and long-term benefits of practices that improve soil health and soil resilience and drawing attention to the costs of practices detrimental to soil health and soil resilience;

(c) promoting research and innovation in relation to sustainable soil management concepts and soil regeneration practices adapted to the local soil characteristics, climatic conditions and land use;

(d) providing, at a local level, information on suitable measures and practices to increase soil health and soil resilience, based on the soil health assessment carried out in accordance with Article 10 and, where appropriate, taking into account documents and scientific tools referred in Article 24(1), point (k);

(e) making available a regularly updated overview of available funding, instruments and other measures that support soil health and soil resilience.

2. Member States shall also do the following, on a regular basis:

(a) assess what technical and financial needs exist in relation to improving soil health and soil resilience;

(b) engage with the public concerned, in particular landowners and land managers, and ensure that the public concerned is given an early and effective opportunity to determine the level of support needed; and

(c) assess the expected effects on soil health and soil resilience of the measures taken in the context of the programmes, plans, targets and measures listed in Annex III.

Article 12

Land take mitigation principles

Without impinging on the autonomy of the Member States with regard to spatial planning, Member States shall ensure that the following principles are taken into consideration in the event of new soil sealing or new soil removal as part of land take, at the appropriate spatial level within their territory:

(a) avoiding or reducing as much as possible the loss of the capacity of the soil to provide multiple ecosystem services, including food production, by:

(i) reducing, as much as possible, the area of soil affected by soil sealing and soil removal, in particular by encouraging the reuse and repurposing of sealed soils, such as existing buildings;

(ii) selecting areas where the loss of ecosystem services would be minimal, in particular areas with severely degraded soils, such as brownfields; and

(iii) carrying out the soil sealing and soil removal in a way that minimises the negative impact on soil, in particular by protecting the surrounding soils or by keeping the soil sealing as reversible as possible;

(b) aiming to offset to a reasonable extent the loss of the capacity of the soil to provide multiple ecosystem services, including through returning ecosystem services by encouraging the de-sealing of sealed soils and the reconstruction of areas that underwent soil removal.

Chapter IV
Management of contaminated sites

Article 13

Risk-based and stepwise approach

1. Member States shall ensure that the risks to human health and the environment of potentially contaminated sites and contaminated sites are identified, managed, and kept at acceptable levels, taking account of the environmental, social and economic impact of the soil contamination and of the risk reduction measures taken pursuant to Article 16(4). Those risks may be evaluated taking into account the current and planned land use during each of the steps referred to in paragraph 2 of this Article.

   Member States shall establish a hierarchy of responsibility to determine the party or parties responsible for the site-specific implementation of paragraph 2, points (b) and (c), of this Article.

2. Without prejudice to more stringent requirements that arise from Union or national law, Member States shall, by … [48 months from the date of entry into force of this Directive], establish a risk-based and stepwise approach for the following:

   (a) the identification of potentially contaminated sites in accordance with Article 14;

(b) the investigation of potentially contaminated sites in accordance with Article 15;

(c) the site-specific risk assessment and management of contaminated sites in accordance with Article 16.

3. The public concerned shall be given early and effective opportunities:

(a) to provide comments on the establishment and concrete application of the risk-based and stepwise approach referred to in paragraph 2;

(b) to provide information relevant for the activities referred to in point (a), such as human biomonitoring or environmental monitoring data from research projects;

(c) to provide information with a view to correcting the information contained in the register referred to in Article 17.

Comments provided under point (a) of this paragraph shall be taken into account when Member States establish and apply the risk-based and stepwise approach.

4. For the purposes of paragraph 3, Member States shall ensure that relevant information is provided to the public in a timely, adequate and effective manner, including by public notices and electronic media.

Article 14

Identification of potentially contaminated sites

1. Member States shall systematically identify potentially contaminated sites on their territory.

2. For the purposes of the identification of potentially contaminated sites, Member States shall establish a list of potentially contaminating activities. Those activities may be further classified or prioritised according to their potential to cause soil contamination based on scientific evidence. When identifying potentially contaminated sites on their territory, Member States shall take into account the following criteria, where relevant:

   (a) past or current operation of a potentially contaminating activity;

   (b) operation of an activity referred to in Annex I to Directive 2010/75/EU;

   (c) operation of an establishment referred to in Directive 2012/18/EU of the European Parliament and of the Council[48];

   (d) operation of an activity referred to in Annex III to Directive 2004/35/CE;

   (e) occurrence of a potentially contaminating event, accident, calamity, disaster, incident or spill liable to cause soil contamination;

[48] Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC (OJ L 197, 24.7.2012, p. 1, ELI: http://data.europa.eu/eli/dir/2012/18/oj).

(f) relevant information resulting from the soil health monitoring carried out in accordance with Articles 6 to 9.

3. Member States shall ensure that potentially contaminated sites existing on or before … [the date of entry into force of this Directive] are identified and duly recorded in the register referred to in Article 17 by … [120 months from the date of entry into force of this Directive].

Article 15

Investigation of potentially contaminated sites

1. Member States shall ensure that soil investigations on potentially contaminated sites identified pursuant to Article 14 are carried out in accordance with paragraph 2 of this Article and with the risk-based and stepwise approach referred to in Article 13.

2. Member States shall lay down rules concerning the timeframe, content, form and prioritisation of soil investigations.

Member States shall take into account potentially contaminated sites located in areas used for the abstraction of water for human consumption in the prioritisation of soil investigations.

Member States may consider baseline reports and monitoring measures implemented in accordance with Directive 2010/75/EU as well as other investigations as soil investigations, if such reports, measures and investigations meet the requirements of this Directive.

3. Member States shall establish a list of specific events that trigger a soil investigation. Soil investigations shall be carried out within the timeframe referred to in paragraph 2.

Article 16

Site-specific risk assessment and management of contaminated sites

1. Member States shall lay down the specific methodology for the site-specific risk assessment of contaminated sites. When establishing such methodology, Member States shall ensure that the phases and principles referred to in Annex V are taken into consideration.

2. Member States shall determine what constitutes an unacceptable risk to human health and the environment resulting from contaminated sites, by taking into account existing scientific knowledge, the opinions of health authorities, the precautionary principle, local specificities, and current and planned land use.

3. For each contaminated site that has been found to be contaminated following an investigation pursuant to Article 15 or by any other means, Member States shall ensure that a site-specific risk assessment is carried out for the current and planned land use to determine whether the contaminated site poses unacceptable risks to human health or the environment. If the information gathered pursuant to Article 15 is sufficient to conclude that the soil contamination does not constitute an unacceptable risk to human health or the environment, or to conclude that soil remediation is needed, Member States may decide not to carry out the site-specific risk assessment.

4. On the basis of the results of the site-specific risk assessment referred to in paragraph 3, or of a conclusion that soil remediation is needed, reached in accordance with that paragraph, Member States shall ensure that the appropriate risk reduction measures are taken and implemented, without undue delay, to reduce to an acceptable level the risks to human health and the environment.

5. When deciding on the appropriate risk reduction measures, Member States shall, while aiming for soil decontamination, including the prevention of further contamination, take into consideration the long-term costs, benefits, effectiveness, durability and technical feasibility of available risk reduction measures. The risk reduction measures may consist of the measures referred to in Annex IV.

6. The Commission is empowered to adopt delegated acts in accordance with Article 21 to adapt Annexes IV and V to scientific and technical progress.

Article 17

Register

1. By … [48 months from the date of entry into force of this Directive], Member States shall, in accordance with paragraph 2, set up and maintain a register of potentially contaminated sites and contaminated sites as established in accordance with this Chapter.

2. The register shall contain the data and information set out in Annex VI, except data and information the disclosure of which would adversely affect public security or national defence.

3. Member States shall manage or supervise the register and ensure that it is regularly reviewed and updated.

4. Member States shall make public, free of charge, the register and the data and information referred to in paragraphs 1 and 2 of this Article. Disclosure of any data and information may be refused or restricted by the competent authority where the conditions laid down in Article 4 of Directive 2003/4/EC are fulfilled.

   The register shall be made available in the form of an online georeferenced spatial database.

Chapter V
Funding, reporting by Member States and information to the public

Article 18

Union funding

Given the priority inherently attached to the establishment of soil monitoring, to soil resilience, and to the management of contaminated sites, the implementation of this Directive shall be supported by Union financial programmes in accordance with their applicable rules and conditions.

The Commission shall assess any gap between the available Union funding and funding needs for supporting Member States in the implementation of this Directive, paying specific attention to environmental monitoring needs.

When implementing this Directive, the Commission and Member States shall be encouraged to make use of financial resources from appropriate sources, including Union, national, regional and local funds, to finance actions with a focus on soil protection, soil resilience and soil regeneration.

Article 19

Reporting by Member States

1. Member States shall report electronically the following data and information to the Commission and to the EEA every six years:

(a) the data relating to, and the results of, the monitoring of soil health and soil health assessments carried out in accordance with Articles 6 to 10;

(b) a trend analysis of soil health for the soil descriptors listed in Annex I, Parts A, B and C, and of soil sealing and of soil removal indicators listed in Annex I, Part D, in accordance with Article 10;

(c) a summary of the progress on:

(i) the support for soil health and soil resilience, in accordance with Article 11;

(ii) the identification and investigation of potentially contaminated sites, the management of contaminated sites, and the registration of potentially contaminated sites and contaminated sites, in accordance with Articles 13 to 17;

Member States shall submit the first of the reports referred to in the first subparagraph by … [78 months from the date of entry into force of this Directive].

2. Member States and the Commission, with the support of the EEA, shall ensure that there is a mutual exchange of the data and information referred to in paragraph 1 of this Article and that such exchange is effective and respects statistical confidentiality. Member States shall also ensure that the Commission and the EEA have timely and effective access to the data and information contained in the register referred to in Article 17.

3. By way of derogation from paragraphs 1 and 2, if disclosure of certain data and information would adversely affect public security or national defence, Member States may decide not to report, exchange or grant access to such data and information.

4. By … [39 months from the date of entry into force of this Directive], Member States shall provide the Commission with online access to the following:

   (a) an up-to-date list of their soil districts and soil units referred to in Article 4 and the information on their geographical extent;

   (b) an up-to-date list of the competent authorities referred to in Article 5.

5. Member States shall inform the Commission of the outcome of the establishment of the risk-based and stepwise approach referred to in Article 13, of the methodology laid down pursuant to Article 16(1), and of what they determine to constitute an unacceptable risk pursuant to Article 16(2).

6. The Commission is empowered to adopt implementing acts establishing the format and the arrangements for submitting the data and information referred to in paragraph 1 of this Article. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 22(2).

Article 20

Information to the public

1. Member States shall make public the results generated by the monitoring of soil health carried out under Article 9 and the soil health assessments carried out in accordance with Article 10 in the form of aggregated data, and make public the register referred to in Article 17.

2. The Commission shall ensure that the public has access to the digital soil health data portal.

   The Commission shall publish the list of the competent authorities as communicated by Member States in accordance with Article 19(4), point (b).

3. Disclosure of any data and information required under this Directive may be refused or restricted where the conditions laid down in Article 4 of Directive 2003/4/EC are fulfilled.

4. Where the Commission or Member States use confidential data to produce European statistics, they shall protect such data in accordance with Regulation (EC) No 223/2009.

The Commission or the EEA shall be required to obtain the explicit authorisation of the authority that collected the confidential data before their disclosure.

Chapter VI
Delegation and Committee procedure

Article 21

Exercise of the delegation

1. The power to adopt delegated acts is conferred on the Commission subject to the conditions laid down in this Article.

2. The power to adopt delegated acts referred to in Article 9(13) and Article 16(6) shall be conferred on the Commission for an indeterminate period of time from … [date of entry into force of this Directive].

3. The delegation of power referred to in Article 9(13) and Article 16(6) may be revoked at any time by the European Parliament or by the Council. A decision to revoke shall put an end to the delegation of the power specified in that decision. It shall take effect the day following the publication of the decision in the *Official Journal of the European Union* or at a later date specified therein. It shall not affect the validity of any delegated acts already in force.

4. Before adopting a delegated act, the Commission shall consult experts designated by each Member State in accordance with the principles laid down in the Interinstitutional Agreement of 13 April 2016 on Better Law-Making.

5. As soon as it adopts a delegated act, the Commission shall notify it simultaneously to the European Parliament and to the Council.

6. A delegated act adopted pursuant to Article 9(13) or Article 16(6) shall enter into force only if no objection has been expressed either by the European Parliament or by the Council within a period of two months of notification of that act to the European Parliament and the Council or if, before the expiry of that period, the European Parliament and the Council have both informed the Commission that they will not object. That period shall be extended by two months at the initiative of the European Parliament or of the Council.

Article 22

Committee procedure

1. The Commission shall be assisted by a committee. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011.

2. Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply.

Chapter VII
Final provisions

Article 23

Access to justice

1. Member States shall ensure that, in accordance with their national legal system, members of the public concerned have access to a review procedure before a court of law, or another independent and impartial body established by law, to challenge the substantive or procedural legality of the soil health assessment, the measures taken pursuant to this Directive and any failures to act of the competent authorities, provided that one of the following conditions is met:

   (a) they have a sufficient interest;

   (b) they maintain the impairment of a right, where administrative procedural law of a Member State requires such impairment as a precondition.

Member States shall determine what constitutes a sufficient interest and impairment of a right, and shall do so consistently with the objective of providing the public with wide access to justice. To that end, the interest of any non-governmental organisation promoting environmental protection and meeting any requirements under national law shall be deemed sufficient for the purposes of the first subparagraph, point (a). Such organisations shall also be deemed to have rights capable of being impaired for the purposes of the first subparagraph, point (b).

2. Standing in the review procedure shall not be conditional on the role that the member of the public concerned played during a participatory phase of the decision-making procedures under this Directive.

3. The review procedure shall be fair, equitable, timely and not prohibitively expensive, and shall provide adequate and effective redress mechanisms, including injunctive relief as appropriate.

Article 24

Support by the Commission

1. The Commission shall provide Member States with the necessary support, assistance and capacity building in order to help them carry out their obligations under this Directive. In particular, the Commission shall, in cooperation with the Member States, draw up documents and develop scientific tools that Member States may use to facilitate them in:

   (a) establishing a soil monitoring framework and determining the number and location of sampling points pursuant to Article 9(1) and (2) and Annex II, Part A, point 1;

   (b) setting the non-binding sustainable target values and operational trigger values for the soil descriptors pursuant to Article 7(2) and Annex I, Parts A and B;

   (c) setting their list of organic contaminants to be monitored pursuant to Article 7(3) and Annex I, Part B;

   (d) assessing the areas not at risk of salinisation that can be excluded from the measurements of electrical conductivity pursuant to Article 9(3), third subparagraph, and Annex I, Part A;

(e) carrying out in-situ sampling of soil descriptors in accordance with Article 9(3), fourth subparagraph and Annex II, Part A, point 2;

(f) determining the values of the soil sealing and soil removal indicators pursuant to Article 9(5) and in accordance with Annex II, Part C;

(g) determining or estimating the values of the soil descriptors pursuant to Article 9(6) and Annex II, Part B;

(h) identifying and assessing any critical loss of ecosystem services and the impact of soil sealing and soil removal on the loss of ecosystem services pursuant to Article 10(3);

(i) identifying potentially contaminated sites and setting a list of potentially contaminating activities pursuant to Article 14;

(j) laying down the specific methodology for the site-specific risk assessment of contaminated sites, taking into account common practices, methodologies and toxicological data pursuant to Article 16; and

(k) providing, at local level, information on measures and practices to increase soil resilience pursuant to Article 11(1), point (d), by providing and regularly updating a repository of knowledge on soil resilience containing practical information on soil management practices.

2. The documents and scientific tools referred to in paragraph 1 shall be drawn up and developed within the following time-limits:

(a) as regards point (a), by … [12 months from the date of entry into force of this Directive];

(b) as regards points (b), (c), (e) and (j), by … [18 months from the date of entry into force of this Directive];

(c) as regards point (i), by … [24 months from the date of entry into force of this Directive];

(d) as regards points (d), (f) and (g), by … [36 months from the date of entry into force of this Directive];

(e) as regards point (h), by … [48 months from the date of entry into force of this Directive].

3. The Commission shall organise regular exchanges of information, experience and best practices between Member States and, where relevant, other stakeholders on the application of this Directive. The first exchange shall take place by … [three months from the date of entry into force of this Directive].

The Commission shall publish the results of the exchanges of information, experience and best practices referred to in the first subparagraph and, where relevant, provide recommendations or guidelines to Member States.

4. The Commission shall facilitate cooperation between Member States to ensure, where appropriate, that competent authorities responsible for neighbouring soil districts in which there are transboundary effects on soil, comparable soil types or land uses across the soil-district border, exchange best practices, and strive to achieve a coherent approach in the application of this Directive.

Article 25

Evaluation and review

1. By … [90 months from the date of entry into force of this Directive], the Commission shall carry out an evaluation of this Directive to assess the progress made towards achieving its objectives and the need to amend it in order to set more specific requirements to achieve its objectives. That evaluation shall take into account, inter alia, the following elements:

   (a) the experience gained through the implementation of this Directive;

   (b) the data and information referred to in Article 19;

   (c) relevant scientific and analytical data, including results from research projects funded by the Union;

(d) an analysis of the remaining progress to be made to achieve healthy soils by 2050;

(e) an analysis of the effectiveness of the support provided by Member States to improve soil health and soil resilience;

(f) an analysis of the possible need to adapt to scientific and technical progress the provisions of this Directive, in particular regarding the following items:

(i) the definition of healthy soils;

(ii) the establishment of criteria for soil descriptors listed in Annex I, Part C, and soil sealing and soil removal indicators listed in Annex I, Part D;

(iii) the addition of new soil descriptors for monitoring purposes or the adjustment of existing soil descriptors and criteria for healthy soil condition listed in Annex I;

(iv) the non-binding sustainable target values and operational trigger values for the soil descriptors pursuant to Article 7(2) and Annex I, Parts A and B, taking into account, inter alia, the objective of ensuring a level playing field within the internal market;

(v) the possibility of establishing a higher percentage of a subset of sampling points chosen for the analysis of the soil biodiversity descriptors referred to in Annex I, Part C, based on the results of the first monitoring cycle.

2. The Commission shall present a report on the main findings of the evaluation referred to in paragraph 1 to the European Parliament, to the Council, to the European Economic and Social Committee and to the Committee of the Regions, accompanied, if appropriate, by a legislative proposal.

Article 26

Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by … [36 months from the date of entry into force of this Directive]. They shall immediately inform the Commission thereof.

   When Member States adopt those measures, they shall contain a reference to this Directive or shall be accompanied by such a reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States.

2. Member States shall communicate to the Commission the text of the main measures of national law which they adopt in the field covered by this Directive. The communication of the non-binding sustainable target values and operational trigger values for soil descriptors listed in Annex I shall be accompanied by a justification.

Article 27

Entry into force

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

Article 28

Addressees

This Directive is addressed to the Member States.

Done at …, …

For the European Parliament	*For the Council*
The President	*The President*

ANNEX I

SOIL DESCRIPTORS, CRITERIA FOR HEALTHY SOIL CONDITION, AND SOIL SEALING AND SOIL REMOVAL INDICATORS

For the purposes of this Annex, the following definitions apply:

(1) ‘natural land’ means an area of land on which the natural processes are dominant and human intervention is minimal or non-existent, and on which the primary ecological functions and species composition have not been substantially modified;

(2) ‘net sealing’ means the result of soil sealing minus de-sealing;

(3) ‘settlement area’ means a settlement area within the meaning of the 2006 Guidelines of the Intergovernmental Panel on Climate Change (IPCC) for National Greenhouse Gas Inventories;

(4) ‘organic soils’ means organic soils within the meaning of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;

(5) ‘mineral soils’ means mineral soils within the meaning of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;

(6) ‘managed soils’ means soils where soil management practices are carried out.

Aspect of soil degradation	Soil descriptor[1]	Criteria for healthy soil condition – non-binding sustainable target values[2]	Land areas exempted from meeting the related criterion
Part A: soil descriptors with criteria for healthy soil condition established at Union level			
Salinisation[3]	Electrical conductivity (deci-Siemens per meter)	< 4 dS m^{-1} when using saturated soil paste extract (eEC) measurement method, or equivalent criterion if using another measurement method	Naturally saline land areas, areas with regular flooding from marine submersion and areas subject to sea spray
Loss of Soil Organic Carbon (SOC)	SOC concentration (g per kg)	– For organic soils: respect targets set for such soils at national level in accordance with Article 4(2) and (4), and Article 11(4) of Regulation (EU) 2024/1991	No exemption
		– For mineral soils: SOC/Clay ratio > 1/13 (that is the ratio of SOC content to the content of the clay fraction (fraction with a diameter of less than 0,002 mm)) Member States are expected to apply corrective factors to the ratio where specific soil types or climatic conditions justify it, taking into account the link to structural stability	Non-managed soils in natural land areas

[1] The minimum criteria for the methodology for in-situ sampling of soil descriptors are provided for in Annex II, Part A, and further details are to be provided pursuant to Article 24.

[2] Further details on the methodology on setting non-binding sustainable target values and operational trigger values for soil descriptors listed in Annex I, Parts A, B and, when possible, Part C, are to be provided pursuant to Article 24.

[3] The measurement of electrical conductivity can be excluded in areas not at risk of salinisation. Further details on the methodology for assessing areas not at risk of salinisation are to be provided pursuant to Article 24.

<table>
<tr><td rowspan="7">Subsoil compaction</td><td rowspan="6">Bulk density in subsoil (g per cm^3)</td><td>Soil texture[4]</td><td>Range</td><td rowspan="7">Non-managed soils in natural land areas and areas with naturally compacted soils</td></tr>
<tr><td>Sand, loamy sand, sandy loam, loam</td><td><1,80</td></tr>
<tr><td>Sandy clay loam, loam, clay loam, silt, silt loam</td><td><1,75</td></tr>
<tr><td>Silt loam, silty clay loam</td><td><1,65</td></tr>
<tr><td>Sandy clay, silty clay, clay loam with 35-45 % clay</td><td><1,58</td></tr>
<tr><td>Clay</td><td><1,47</td></tr>
<tr><td colspan="2">Member States may apply different texture classes or values corresponding to the levels considered problematic for plant rooting system development</td></tr>
<tr><td>Optional:
– saturated hydraulic conductivity – Ksat (cm per day)
– air capacity (%)</td><td colspan="2">≥ 10 cm/day[5]
Member States may adapt this value according to their local soil conditions
≥ 5 %[6]
Member States may adapt this value according to their local soil conditions</td></tr>
</table>

[4] As defined in IUSS Working Group WRB. 2022. World Reference Base for Soil Resources. International soil classification system for naming soils and creating legends for soil maps. 4th edition. International Union of Soil Sciences (IUSS), Vienna, Austria.

[5] Lebert, M., Böken, H., Glante, F. 2007. Soil compaction—indicators for the assessment of harmful changes to the soil in the context of the German Federal Soil Protection Act. Journal of Environmental Management 82(3): 388-397.

[6] Lebert, M., Böken, H., Glante, F. 2007. Soil compaction—indicators for the assessment of harmful changes to the soil in the context of the German Federal Soil Protection Act. Journal of Environmental Management 82(3): 388-397.

Part B: soil descriptors with criteria for healthy soil condition established at Member State level			
Excess nutrient content in soil	Extractable phosphorus (mg per kg)	< 'maximum value' Member States shall lay down their own maximum value, at a level that would not entail damage to human health and the environment	Non-managed soils in natural land areas
Soil erosion	Soil erosion rate (tonnes per hectare per year)	< 'maximum value' Member States shall lay down their own maximum value, at a level that would not entail damage to human health and the environment	Badlands and natural land areas, except if they represent a significant disaster risk
Soil contamination	– concentration of heavy metals in soil: As, Sb, Cd, Co, Cr (total), Cu, Hg, Pb, Ni, Tl, V, Zn (mg per kg) – concentration of a selection of organic contaminants established by Member States and taking into account existing concentration limits in Union law, e.g. for water quality and air emissions	Reasonable assurance, obtained from soil point sampling, identification and investigation of potentially contaminated sites and any other relevant information, that an unacceptable risk to human health and the environment from soil contamination does not exist Natural and anthropogenic background levels shall be taken into account in the risk assessment If natural background is the only reason leading to unacceptable risks, then the relevant soil shall be deemed to meet the healthy soil criteria provided that it is managed in such a way that an unacceptable risk to human health does not exist Habitats with a naturally high concentration of heavy metals that are included in Annex I to Directive 92/43/EEC shall remain protected	No exemption

Reduction of soil water retention and infiltration	Water retention: – soil water holding capacity of the soil sample (% of water per total soil (volume or mass)) Water infiltration: – saturated hydraulic conductivity – Ksat (cm per day) – air capacity (%)	The estimated value for the total water holding capacity, the saturated hydraulic conductivity and the air capacity of a soil unit is above the minimal threshold and may also be assessed by river basin or sub-basin, taking into account water processes occurring at that scale The minimal threshold shall be set (in tonnes) by the Member State at the relevant scale, at such a value that the impacts of flooding following intense rain events or of periods of low soil moisture due to drought events are mitigated	No exemption
Loss of SOC	SOC stocks (tC ha^{-1}) Optional: – soil organic carbon content (g per kg)	Contribute to national targets for net greenhouse gas removals in the LULUCF sector as referred to in Article 4(3) of Regulation (EU) 2018/841 > ‘minimum value’ Member States shall lay down the minimum value by soil texture	No exemption

Part C: soil descriptors without criteria	
Aspect of soil degradation	Soil descriptor
Excess nutrient content in soil	Total nitrogen content in soil (mg g^{-1}) SOC to nitrogen ratio
Acidification	Soil acidity (pH) Member States may also select the optional descriptor: – base saturation (i.e. (Ca + Mg + K)/effective cation exchange capacity (CEC))
Topsoil compaction	Bulk density in topsoil (A-horizon[7]) (g cm^{-3}) Optional: – saturated hydraulic conductivity (cm per day) – air capacity (%)

[7] As defined in the FAO Guidelines for Soil Description, Chapter 5 (https://www.fao.org/3/a0541e/a0541e.pdf).

Loss of soil biodiversity	DNA metabarcoding for fungi and bacteria Member States may also select at least one optional soil descriptor for biodiversity, such as: – metabarcoding of archaea, protists and animals – phospholipid fatty acid analysis (PLFA) – abundance and diversity of nematodes – abundance and diversity of earthworms – abundance and diversity of springtails – abundance and diversity of native ants – soil biological quality based on arthropods (QBS-ar) – presence of invasive alien species and plant pests – soil basal respiration

Soil contamination[8]	Concentrations of PFAS-21[9] or concentrations of PFAS-43[10] or selected PFAS set by Member States in accordance with Article 7(4) Concentrations of selected active substances in pesticides and their metabolites set by Member States in accordance with Article 7(4) Optional: – concentrations or presence of a selection of other emerging soil contaminants set by Member States in accordance with Article 7(4)

[8] May be measured on a limited number of sampling points.

[9] 6:2 FTS, PFBA, PFBS, PFDA, PFDoDA, PFDoDS, PFDS, PFHpA, PFHpS, PFHxA, PFHxS, PFNA, PFNS, PFOA, PFOS, PFPeA, PFPeS, PFTrDA, PFTrDS, PFUnDA, PFUnDS or other 21 PFAS, as available in the laboratories.

[10] PFOS, PFOA, PFHxS, PFNA, PFBS, PFPeS, PFHpS, PFNS, PFDS, PFUnDS, PFDoDS, PFTrDS, PFBA, PFPeA, PFHxA, PFHpA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFOSA, N-EtFOSA, N-MeFOSA, FOSAA, N-EtFOSAA, N-MeFOSAA, FHxSA, N-EtFHxSA, N-MeFHxSA, FHxSAA, N-EtFHxSAA, N-MeFHxSAA, FBSA, N-EtFBSA, N-MeFBSA, FBSAA, N-EtFBSAA, N-MeFBSAA, 6:2 FTS, 8:2 FTS, 5:3 FTCA, 7:3 FTCA or other 43 PFAS, as available in the laboratories.

Part D: soil sealing and soil removal indicators	
Aspect of soil degradation	Soil sealing and soil removal indicators
Soil sealing and soil removal	Total sealed soils and areas that underwent soil removal (km² and % of Member State surface) Soil sealing and soil removal, de-sealing and net-sealing (average per year – in km² and % of Member State surface) Total settlement area (km² and % of Member State surface) Land use change to and from settlement area (average per year – in km² and % of Member State surface) Member States may also measure other related optional indicators, such as: – soil artificialisation – land fragmentation – land recycling rate – land taken for commercial activities, logistic hubs, renewable energies, surfaces such as airports, roads, mines, – consequences of soil sealing and soil removal, such as quantification of loss of ecosystem services, change in the intensity of floods

ANNEX II

METHODOLOGIES

Part A: Methodology for determining the number and location of sampling points and for the sampling survey

Activity	Minimum criteria for methodology
1. Determination of sampling points (sampling survey) for soil health assessment	The sampling survey shall be designed from a complete sample frame containing the best available information on the distribution of soil properties, such as information resulting from relevant measurements pursuant to Article 9(3) and (4) The sampling scheme shall be a stratified random sampling optimised on the best available information on the variability of soil descriptors, and the stratification shall be based on the soil units established in accordance with Article 4(2). Sampling points related to measurements referred to in Article 9(4) may be taken into account partly or completely in the sampling scheme, regardless of their design The number and location of the sampling points shall represent the variability of the chosen soil descriptors within the soil units, with a maximum error percentage (or coefficient of variation) of 5 % The allocation and size of the sample shall be determined by applying appropriate procedures (e.g. the Bethel algorithm - Bethel, 1989[1]) which are able to account for the required maximum estimation error The sampling survey designed by the Member States for each monitoring cycle may change or remain the same Further details on determining the number and location of sampling points are to be provided pursuant to Article 24(1), point (a)

[1] Bethel, J. 1989. 'Sample Allocation in Multivariate Surveys.' Survey Methodology 15: 47–57.

Activity	Minimum criteria for methodology
2. Field sampling survey	Exact sampling locations shall be sampled unless duly justified circumstances, such as soil saturated with water or a high level of rock content, prevent the sampling of the locations When soil composite samples are taken, they shall be a mixture of at least 5 subsamples When sampling soil in non-forested areas, residues and organic debris shall be removed from the surface When sampling soil in forested areas, the forest floor, if relevant subdivided into litter and organic layers, shall be sampled separately and the thickness and weight shall be recorded Samples or subsamples for the composite sample shall, where possible, be taken to a depth of at least 30 cm of soil. Information such as soil type and if possible genetic soil horizons shall be recorded. Subsamples shall be mixed together in order to get a homogeneous composite sample. Sampling may be done by fixed depth or by horizon, but data shall be reported by fixed depth Bulk density samples shall be undisturbed samples taken at the relevant depth, including below 30 cm for subsoil. Samples related to soil compaction (saturated hydraulic conductivity and air capacity) may be the same undisturbed samples as those taken for bulk density. Where high content of coarse fragments in soil prevents sample taking, sampling may be excluded in that location for measuring bulk density Further details on the field sampling survey are to be provided pursuant to Article 24(1), point (a), including on how to handle specific situations such as shallow soils and different sampling depths

Part B: Methodology for determining or estimating the values of soil descriptors

Where a reference methodology is set out in the table below, the following methodologies are to be used in accordance with Article 9:

– the reference methodology;

– a methodology equivalent to the reference methodology; or

– another methodology, provided that it is available in the scientific literature or publicly available and a validated transfer function is available.

If a CEN methodology is available, it shall be preferred over the reference methodology. In that case, the initial reference methodology shall be considered to be an equivalent methodology.

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Soil texture (clay, silt and sand content – needed for the determination of other descriptors and related ranges)	ISO 11277 Determination of particle size distribution in mineral soil material – Method by sieving and sedimentation	Not applicable	YES

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Electrical conductivity	Option 1: ISO 11265 Determination of the specific electrical conductivity Option 2: saturated soil paste extract (eEC) measurement method (FAO SOP: GLOSOLAN-SOP-08[2])	Not applicable	YES

[2] https://www.fao.org/3/cb3355en/cb3355en.pdf.

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Soil erosion rate		Soil erosion rate estimation shall take into account all actions taken to mitigate or compensate the erosion risk, including post-fire mitigation measures Soil erosion rate estimation shall include all relevant erosion processes such as erosion by water, wind, harvest and tillage Soil erosion by water shall be assessed by considering the following factors: – soil characteristics (e.g. erodibility, soil crusting, soil roughness, stoniness) – topography (e.g. slope steepness and length) – climate (e.g. rainfall erosivity – intensity and duration) – vegetation cover, crop type, land use and management practices to control or reduce erosion – management practices (e.g. cover crops, reduced tillage, mulching, etc.) – burned areas	Not applicable

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
		Soil erosion by wind shall be assessed by considering the following factors: – soil characteristics (e.g. erodibility) – climate (e.g. soil moisture, wind speed, evaporation) – vegetation (e.g. crop type) – management practices to control or reduce erosion (e.g. wind breaks) Soil erosion by management practices such as tillage or export of biomass shall be quantitatively assessed based on a methodology either available in the scientific literature or publicly available	

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Soil Organic Carbon (SOC)	ISO 10694 Determination of organic and total carbon after dry combustion, ensuring all carbon is incinerated SOC shall be calculated by determining the total carbon content and subtracting the carbon present as carbonate, which shall be determined in accordance with ISO 10693	Not applicable	YES
SOC stocks	Methodology as set out in Annex V to Regulation (EU) 2018/1999 in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories	Not applicable	YES

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Bulk density in subsoil	ISO 11272 for determination of dry bulk density Where an equivalent parameter is chosen, the methodology shall be either a European or international standard where available; if such standard is not available, the methodology chosen shall either be available in the scientific literature or publicly available	Methodology may be refined depending on the proportion of coarse fragments	YES
Extractable phosphorus	Preferred: ISO 11263 for spectrometric determination of phosphorus soluble in sodium hydrogen carbonate solution (P-Olsen) Other methods may be used as an alternative	Not applicable	YES

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
– concentration of heavy metals in soil: As, Sb, Cd, Co, Cr (total), Cu, Hg, Pb, Ni, Tl, V, Zn – concentrations of other contaminants (including PFAS, pesticides and their metabolites) defined or selected by Member States	For heavy metals: ISO 54321: Aqua Regia Optional: bioavailable fractions of contaminants, such as ISO 17586 using dilute nitric acid	For contaminants other than heavy metals: use European or international standards where available; if such standard is not available, the methodology chosen shall either be available in the scientific literature or publicly available	For heavy metals: YES For contaminants other than heavy metals: not applicable if European or international standards are not available

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Soil water holding capacity, air capacity and saturated hydraulic conductivity	Methodology to determine the value for one sample point: (1) Soil water holding capacity and air capacity: Option 1: LABORATORY: ISO 11274 for determination of the water-retention characteristic Option 2: ESTIMATION: apply pedotransfer functions requiring input variables such as particle size distribution, bulk density, soil organic carbon concentration	Minimum criteria for estimating the total soil water holding capacity, the air capacity and the saturated hydraulic conductivity of a soil unit or on a river basin or sub-basin scale: – for the area of soil not sealed or areas that did not undergo soil removal, estimate the total value of soil water holding capacity, air capacity and saturated hydraulic conductivity – for the area of sealed and removed soils, consider setting the water holding capacity, air capacity and saturated hydraulic conductivity of impervious areas to zero, attributing proportionately intermediate values to semi-impervious and other artificial areas	YES (for point value)

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
	(2) Saturated hydraulic conductivity: Option 1: LABORATORY: ISO 17313: Determination of hydraulic conductivity of saturated porous materials Option 2: ESTIMATION: apply pedotransfer functions requiring input variables such as particle size distribution, bulk density, soil organic carbon concentration		

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Nitrogen in soil	Option 1: ISO 11261 for determination of total soil nitrogen using a modified Kjeldahl method Option 2: ISO 13878 for determination of total nitrogen by dry combustion	Not applicable	YES
Soil acidity	ISO 10390 for determination of pH in H_2O, KCl and $CaCl_2$ extract	Not applicable	YES

Soil descriptor	Reference methodology	Minimum methodological criteria	Validated transfer function required (if using a methodology different from the reference methodology)?
Base saturation and exchangeable concentrations of sodium, potassium, calcium and magnesium	ISO 11260 for determination of effective cation exchange capacity and base saturation level using $BaCl_2$	Not applicable	YES
Bulk density in 'topsoil' (A-horizon[3])	ISO 11272 for determination of dry bulk density	Methodology may be refined depending on the proportion of coarse fragments	YES
Soil descriptors linked to soil biodiversity and biological activity		Use European or international standards where available; if such standard is not available, the methodology chosen shall either be available in the scientific literature or publicly available	Not applicable

[3] As defined in the FAO Guidelines for Soil Description, Chapter 5 (https://www.fao.org/3/a0541e/a0541e.pdf).

Part C: Minimum methodological criteria for determining the values of the soil sealing and soil removal indicators

For the soil sealing and soil removal indicators, the methodologies used shall comply with the definitions set out in Article 3 and Annex I. Such methodologies shall make use of at least the Copernicus services or, preferably, best available data including remote-sensing images, which shall be supplemented with relevant national inventories.

For the settlement area indicator, Member States may use data collected under Regulation (EU) 2018/841, provided that such data are reported at soil district level.

The methodologies chosen shall either be available in the scientific literature or publicly available.

ANNEX III

PROGRAMMES, PLANS, TARGETS AND MEASURES
REFERRED TO IN ARTICLE 10

(1) The national restoration plans prepared in accordance with Regulation (EU) 2024/1991.

(2) The strategic plans to be drawn up by Member States under the Common Agricultural Policy, in accordance with Regulation (EU) 2021/2115.

(3) The Code of Good Agricultural Practice and the action programmes for designated vulnerable zones adopted in accordance with Directive 91/676/EEC.

(4) The conservation measures and prioritised action framework established for Natura 2000 sites in accordance with Directive 92/43/EEC.

(5) The measures for achieving good ecological status and good chemical status of surface water bodies and good chemical and quantitative status of groundwater bodies included in river basin management plans prepared in accordance with Directive 2000/60/EC.

(6) The flood risk management measures included in the flood risk management plans prepared in accordance with Directive 2007/60/EC.

(7) The drought management plans referred to in the EU Climate Adaptation Strategy.

(8) The national action programmes established in accordance with the United Nations Convention to combat desertification.

(9) The national biodiversity strategies and action plans established in accordance with Article 6 of the United Nations Convention on Biological Diversity.

(10) The targets set under Regulation (EU) 2018/841.

(11) The targets set under Regulation (EU) 2018/842.

(12) The national air pollution control programmes prepared under Directive (EU) 2016/2284 and the monitoring data about air pollution impacts on ecosystems reported under that Directive.

(13) The integrated national energy and climate plan established in accordance with Regulation (EU) 2018/1999.

(14) The risk assessments and disaster risk management planning established in accordance with Decision No 1313/2013/EU.

(15) The National Action plans adopted in accordance with Article 4 of Directive 2009/128/EC.

(16) The mitigation and risk reduction measures referred to in the environmental impact assessments performed in accordance with Directive 2011/92/EU for the plans and projects that might have a negative impact on the soil.

ANNEX IV

INDICATIVE LIST OF RISK REDUCTION MEASURES

(1) Soil remediation techniques for in-situ or ex-situ soil remediation:

(a) Physical soil remediation techniques:

(i) vapor extraction, air sparging;

(ii) heat treatment, steam injection, thermal desorption, vitrification;

(iii) soil washing and flushing;

(iv) liquid layer removal.

(b) Biological soil remediation techniques:

(i) stimulation of aerobic or anaerobic degradation: bioremediation, biostimulation, bioaugmentation, bioventing, biosparging;

(ii) phytoextraction, phytovolatilisation, phytodegradation;

(iii) composting, soil amendments, landfarming, and bioreactor systems;

(iv) biofiltration, biotreatment wetlands, and biobeds;

(v) monitored natural attenuation.

(c) Chemical remediation techniques:

(i) chemical oxidation;

(ii) chemical reduction and reduction-oxidation (redox) reactions;

(iii) pump and treat groundwater;

(iv) remediation techniques to reduce the transfer of contaminants through isolation, containment and monitoring:

(1) surface capping, reactive barriers, encapsulation;

(2) chemical stabilisation, solidification and immobilisation;

(3) geo-hydrological isolation and containment;

(4) phyto-stabilisation;

(5) control and aftercare through monitoring wells.

(2) Risk reduction measures, other than soil remediation, to reduce exposure:

(a) Restrictions on the cultivation and consumption of crops and vegetables;

(b) Restrictions on the consumption of eggs;

(c) Restrictions on the access of pets or livestock;

(d) Restrictions on the extraction or use of groundwater for drinking, personal hygiene or industrial purposes;

(e) Restrictions on demolition, de-sealing, or construction on the site (e.g. constructive measures for ventilation, tanking, etc.);

(f) Restrictions on access to the site (e.g. through fencing) or to the areas surrounding the site;

(g) Restrictions on land use or land use changes;

(h) Restrictions on digging, drilling or excavation;

(i) Restrictions to avoid contact with soil, dust or indoor air, and applying precautions to protect human health (e.g. respirators, gloves, wet cleaning, etc.).

(3) Best available techniques referred to in Directive 2010/75/EU.

(4) Measures taken by competent authorities and industrial operators following a major accident, in accordance with Directive 2012/18/EU.

ANNEX V

PHASES AND PRINCIPLES FOR SITE-SPECIFIC RISK ASSESSMENT

1. Characterisation of the contamination requires identifying the nature of the contaminants (e.g. heavy metals, organic contaminants, etc.) present at the site and determining their source, concentration, chemical form, and distribution in the soil, parent material and groundwater. The presence and concentration of contaminants in the different media is determined through sampling and investigation on-site and off-site in the event that a transfer of contaminants is suspected. Contaminants associated with potentially contaminating activities shall be sampled in the relevant media on the basis of the environmental context and the physico-chemical properties of the contaminants that influence their behaviour in the environment. Natural and anthropogenic background levels shall be considered.

2. Exposure assessment requires identifying the path by which soil contaminants may reach receptors. Exposure pathways can include inhalation, ingestion, dermal contact, plant uptake, migration to groundwater or others. The concentrations of the contaminants in the exposure media are combined with exposure parameters (e.g. frequency and duration of exposure, soil ingestion rate, etc.) and receptor characteristics such as age, gender, and health status to estimate the daily exposure dose. The source-pathway-receptor linkages are summarised in a graphic, schematic and simplified representation (the ‘conceptual site model’). Exposure may be assessed through direct analysis at the point of exposure or by modelling the transfer of a contaminant to the medium of exposure.

3. Toxicity or hazard assessment involves the evaluation of the potential adverse effects of the contaminants on human health and the environment, based on the dose and duration of exposure. Toxicity or hazard assessment takes into account the inherent toxicity of the contaminants and the susceptibility of different exposed receptors (humans and ecosystems), such as animals, micro-organisms, plants, children, pregnant women, the elderly, etc. The toxicological information is used to estimate reference doses or concentrations, which are used for the risk characterisation.

4. Risk characterisation requires integrating the information from the previous steps to estimate the magnitude and probability of adverse effects of the contaminated site on human health and the environment, including from migration of the contamination to other environmental media. The risk characterisation helps to assess and prioritise the need for risk reduction measures and remediation measures, and to ensure that the condition of the soil is compatible with the current and planned land use. It can also help to establish soil remediation or management objectives for a site, e.g. to achieve maximum acceptable limits or site-specific risk-based screening values. Risk assessment involves a large number of hypotheses and uncertainties. It is therefore essential to evaluate those hypotheses and uncertainties to fully understand the significance of the results obtained and to make well-informed decisions.

ANNEX VI

CONTENT OF REGISTER OF POTENTIALLY CONTAMINATED SITES AND CONTAMINATED SITES

The design and presentation of the data in the register shall enable the public to track progress in the identification and investigation of potentially contaminated sites and the management of contaminated sites. The register shall contain and present the following information at site level for the known potentially contaminated sites, contaminated sites, contaminated sites requiring further action, and contaminated sites where action was taken or is being taken:

(a) the coordinates, address or cadastral parcel(s) of the site in accordance with Directives (EU) 2019/1024 and 2007/2/EC;

(b) the year of inclusion in the register;

(c) contaminating or potentially contaminating activities that have taken or are taking place on the site;

(d) the management status of the site;

(e) conclusions regarding the presence or absence, type and risk of the contamination (or residual contamination after soil remediation) where information on those elements is already available from the soil investigations and site-specific risk assessment referred to in Articles 15 and 16;

(f) required subsequent actions and management steps referred to in Articles 15 and 16.

The register may also contain the following information at site level for the known potentially contaminated sites, contaminated sites, contaminated sites requiring further action, and contaminated sites where action was taken or is being taken, where available:

(a) information on environmental permits issued for the site, including the start and end year of the activity;

(b) current and planned land use;

(c) results of soil investigation and soil remediation reports, such as concentrations and contours of the contamination, conceptual site model, risk assessment methodology, techniques used or planned, effectiveness and cost estimates of risk reduction measures;

(d) timeline of subsequent actions and management steps.