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Towards a comprehensive assessment of soil biodiversity in Germany: status quo, challenges, and policy implications

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Abstract

Healthy soils and the biodiversity therein are the prerequisite for the supply of manifold ecosystem services that are essential for human well-being. Detailed knowledge, especially at the national level, is important for effective policy-making to safeguard healthy functional soils for future generations. Hence, synthesis of the state of soil biodiversity and related ecosystem functions, the driving forces affecting the soil as a habitat, avenues for sustainable soil management, and the role of stakeholders at different levels is required. Here, we present the eleven key messages of the first comprehensive soil biodiversity assessment in Germany, based on the currently available and accessible literature and expert knowledge. Among others, we highlight the high biodiversity of soils in Germany, their role for climate regulation and other ecosystem services, the impact of multiple concurrent drivers, as well as actions and schemes already in place to sustainably manage soil biodiversity and to raise awareness in different groups of the public. We conclude that national assessments of the available literature and data are an important step towards the incorporation of soil biodiversity in national policies and to provide the basis for national long-term systematic monitoring.

Keywords Biodiversity change | Human impact | Soil protection | Soil health | Policy-making | Literature synthesis

Background

Given the progressing anthropogenic environmental changes, there is growing concern regarding the fate of biodiversity as well as the ecosystem functions and services they provide (Díaz et al. 2019, Isbell et al. 2023). Consequently, numerous recent biodiversity assessments have been conducted at the global (IPBES 2019, Isbell et al. 2023), regional (IPBES 2018), and national levels (Wirth et al. 2024). In most of these biodiversity assessments, a significant fraction of global biodiversity was not covered or is underrepresented, such as the biodiversity below the ground, although soil and soil organisms can be found in all terrestrial ecosystems and are the prerequisite for the supply of essential ecosystem services (FAO et al. 2020). To address this major gap, the recent German biodiversity assessment (the so-called "Faktencheck Artenvielfalt"; Wirth et al. 2024) dedicated a specific expert group as well as a systematic literature search of published and grey literature to soil biodiversity, and dedicated a separate section to this important topic in their report. In short, the systematic literature search and scoping included over 5,500 scientific papers (indexed in Web of Science by 31 July 2023) and grey literature reports (via manual search of reports by governmental and non-governmental organisations) covering the state and temporal trends of soil biodiversity, drivers of soil biodiversity change, and soil-related ecosystem services in Germany. The expert group consisted of 22 German soil biodiversity experts that analysed the available literature and wrote the section on soil biodiversity in the German biodiversity assessment as well as two rounds of revisions by 22 external experts from research and non-research institutions (for more details see Wirth et al. 2024). Here, we present the eleven main conclusions from this national soil biodiversity report (see Fig. 1 for a guide on the covered topics and a high-level synthesis of the main results). The sequence of the conclusions is not based on their significance, but on the structure of the original soil biodiversity report (Eisenhauer et al. 2024). All conclusions are based on the available literature and data from Germany at the time of the release of the original national soil biodiversity report in 2024. Hence, while some of the conclusions are more specific for Germany, Central Europe, and temperate ecosystems, others are generic and may also apply to many other regions of the world. We hope that this short synthesis will inform and inspire future national to global soil biodiversity assessments (Guerra et al. 2024). Moreover, by involving societal stakeholders in all their complexity, we intend to enhance awareness by reflection and learning about the relevance and intrinsic value of soil biodiversity. The overall aim is to enable decision-makers to develop and implement specific strategies for soil biodiversity protection, conservation, restoration and a comprehensive soil health assessment.

Key messages

1. Soils are biologically highly diverse and our knowledge varies greatly among different taxonomic groups.

According to recent estimates, 59 % of all terrestrial species worldwide are directly associated with the soil (Anthony et al. 2023). The level of knowledge varies greatly depending on the organism group and decreases sharply with decreasing body size and simultaneously increasing species diversity, e.g. an estimated 60 % of the world's ant species are described, compared to only 0.2–2 % of its nematode species (Orgiazzi et al. 2016). Germany, for instance, harbours 56 centipede species (Decker et al. 2016), 560 oribatid mite species (Weigmann et al. 2015), and a very

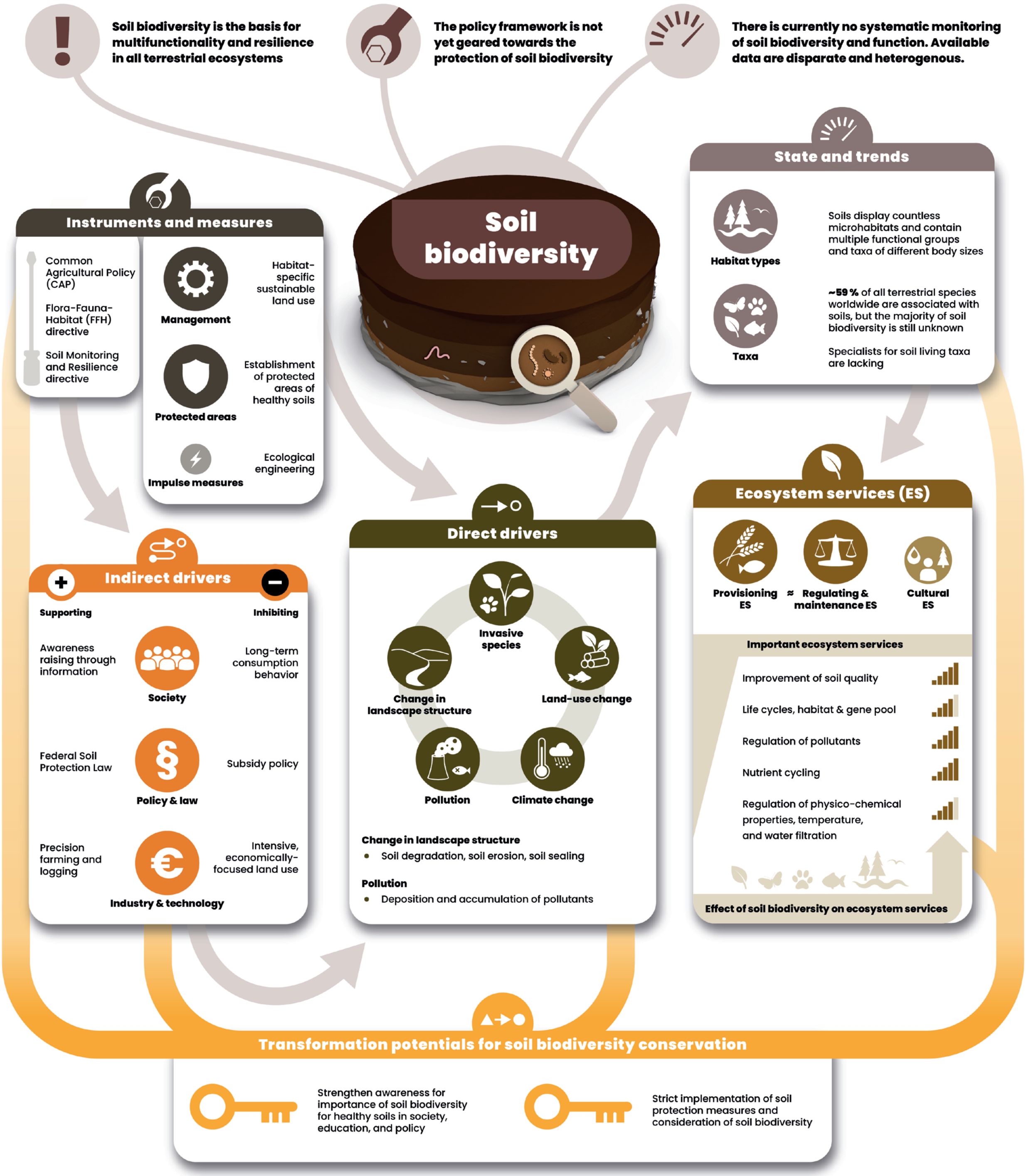

Figure 1. Overview of the state and trends of soil biodiversity, their effects on ecosystem functions and services, direct and indirect drivers of biodiversity change, important instruments and management measures, as well as potentials for a transformation towards sustainability of soil biodiversity. The top row represents the three most important/pressing take-home messages. Each box represents the synthesized main topic-related findings based on the national soil biodiversity report, i.e., summarizing available information and data of the last decades. Arrows between boxes depict effect directions and/or dependencies. Figure modified from Eisenhauer et al. (2024).

rough estimate of 2000 nematode species (Sturhan & Hohberg 2016). While many species occur across different ecosystem and land-use types, other taxa show distinct associations with only one or a few land-use types. For instance, 9 out of 56 centipede species occur exclusively in open grassland habitats (Barber 2009, Spelda 1999, Voigtländer 2005), and 10 out of 49 earthworm species live exclusively in forests (Graefe et al. 2019). In general, we have relatively good knowledge of soil macrofauna taxa such as earthworms and millipedes, for which species lists and risk assessments for Germany are available (Decker et al. 2016, Lehmitz et al. 2016). However, these German risk assessments of soil macrofauna taxa prove to be exceptional, with only few other regional red lists including soil-dwelling taxa (Phillips et al. 2017). In contrast, we largely lack Red Lists for mesofauna, while for microfauna and microorganisms not even estimates of the biological diversity are available (Orgiazzi et al. 2016). This crucial lack of information becomes especially apparent with regards to taxa driving important ecosystem functions. Recent developments in the assessment of soil biodiversity, such as metabarcoding (Bonkowski et al. 2019), are however rapidly improving our information on the diversity as well as spatial and temporal distribution of soil organisms (e.g., Wang et al. 2024). For more information on the state of soil biodiversity in Germany, please refer to Hohberg et al. (2025).

2. For evaluating the implications of environmental change, an understanding of (long-term) temporal variation in soil biodiversity and ecosystem functions is urgently required.

In Germany, as being the case in Europe, there is currently no systematic and long-term survey of soil organisms and soil ecosystem functions, representative of soilscapes and land-use types. Systematic data collection for soil biota in permanent observation plots has only been carried out for specific land-use types, only in a few federal states of Germany, and only for selected taxa (e.g., Walter & Burmeister 2022, Wolf et al. 2024). Long-term systematic data collection of soil ecosystem functions and services is only conducted in the long-term soil erosion monitoring in Lower Saxony (Steinhoff-Knopp & Burkhard 2018). At the European and global scale, large-scale monitoring activities exist, such as LUCAS (Orgiazzi et al. 2022) and Soil BON (Guerra et al. 2021), respectively, that *inter alia* highlighted potential small-scale variations in space and time that require long-term systematic national monitoring (Guerra et al. 2024, Hohberg et al. 2025). However, standardised, regular, continuous, Germany-wide data collection for a large number of species groups and ecosystem functions on the same plots is still lacking. Recently, the National Soil Monitoring Centre and the National Monitoring Centre for Biodiversity embarked on a collaborative project to initiate a baseline survey of soil biodiversity for various soil taxa and long-term monitoring in Germany. However, there is still an urgent need to advance information on species diversity in soils in spatially representative and temporally meaningful monitoring programs using taxonomic expertise combined with molecular methods (Guerra et al. 2021, Nabel et al. 2021). However, an indispensable prerequisite for molecular monitoring are complete and taxonomically sound reference libraries of species markers, which are largely lacking particularly for soil organisms (but see Collins et al. 2023, Lehmitz & Decker 2017, Schenk et al. 2017). Another key challenge is to differentiate temporal natural variation of biodiversity from long-term trends. Furthermore, for economic proportionality and feasibility of implementing monitoring programs, the definition of operational indicators, possibly including specific groups of organisms and/or biological community parameters (e.g., diversity indices) is indispensable. Finally, it should be noted that a prospective EU Soil Monitoring and Resilience Law (EC - European Commission 2023) will likely require member states to report the status of soil biodiversity as a key component of soil health.

3. A high soil biodiversity is the basis for the multifunctionality and resilience of terrestrial ecosystems.

In terrestrial ecosystems, ecosystem functions are often provided by consortia of soil microorganisms, and fauna (especially invertebrates), with different functional groups complementing each other (Bardgett & van der Putten 2014, Heemsbergen et al. 2004). This "cooperative" biodiversity affects ecosystem functions, such as litter decomposition and mineralization (Beaumelle et al. 2020, Heemsbergen et al. 2004, Soliveres et al. 2016). Due to the three-dimensional matrix of the soil habitat, there is also a connection between morphological diversity (including body size and shape) and ecosystem functions (Motiejūnaitė et al. 2019). Ecosystem functions are, besides abiotic processes, primarily determined by the functional diversity, biomass, and metabolic activity of soil organisms (Barnes et al. 2014, Bonfanti et al. 2025, Heemsbergen et al. 2004). They are therefore essential for the maintenance of biogeochemical cycles. However, it remains to be explored how the multiple types of interactions in the soil at different spatio-temporal scales actually affect ecosystem functioning. Irrespective of the land-use or soil types, it is generally assumed that ecosystem multifunctionality (i.e., the simultaneous support of several ecosystem functions) and the stable provisioning of ecosystem functions and services supported by soil biodiversity can only be guaranteed by the interaction of many different groups of soil organisms (Delgado-Baquerizo et al. 2020, Eisenhauer et al. 2012, Wagg et al. 2014). For more information on the interactive role of soil fauna and microbiota towards multifunctionality, please refer to Ruess et al. (2025).

4. Soil biodiversity is an essential driver of terrestrial carbon and nutrient cycling.

In terrestrial ecosystems, typically the major part of the net primary production (i.e., carbon sequestered by plants from CO_2 via photosynthesis), which can amount to up to 90 % in forests, enters directly into the biological soil decomposition system controlled by microorganisms and soil animals (Gessner et al. 2010). These inputs fuel the major biogeochemical cycles, i.e., of carbon, nitrogen, and other nutrients. Therefore, soil animals and microorganisms are of central importance for ecosystem functions and nutrient storage in soils. These ecosystem functions, in turn, represent an essential basis for maintaining biodiversity and productivity in all land-use types, i.e., arable land, grassland, forest, wetland areas, as well as in coastal regions. Yet, the links between soil biodiversity and these ecosystem functions are not sufficiently understood in any of these land-use types. In addition, the release of the most important greenhouse gases (source function) - carbon dioxide, methane, and nitrous oxide - and their removal from the atmosphere (sink function) are important climate-relevant regulating ecosystem services that are performed by soil organisms (Paustian et al. 2016). Microorganisms in soils often act as an important, sometimes even the only sink of greenhouse gas in mineral soils, as is the case for methane (Kolb 2009, Täumer et al. 2021) and nitrous oxide (Chen et al. 2021, Conthe et al. 2018). However, the quantitative and mechanistic relationships between soil biodiversity and the ecosystem function of a greenhouse gas sink are largely unknown. The storage of carbon in soils depends in addition to the management of cultivated soils (growth vs. removal of biomass) on the interaction of microorganisms, plants, and animals in soils. Also, in this case, the quantitative relationships between soil biodiversity and ecosystem function are not clear. Whether and to what extent anthropogenic nutrient inputs (e.g., through agricultural fertilisation or atmospheric deposition) can affect the stability and maintenance of these ecosystem functions in soils is still uncertain. For more information on the interplay of soil biodiversity, carbon and nutrient cycling, and climate change, please refer to Ruess et al. (2025).

5. The interactions of soil biodiversity with the structures, processes, and functions of its habitat supply soil-related ecosystem services and are the prerequisite for the associated aboveground life.

The supply of many ecosystem services is characterised by the interactions of soil biotic and abiotic elements and processes. Soil biodiversity-mediated ecosystem services are of utmost relevance to society, as a large proportion of them are indispensable for supporting the human population and their economy (Delgado-Baquerizo et al. 2020, Fonte et al. 2023, Scherzinger et al. 2024, Soliveres et al. 2016). Most support for a positive link between soil biodiversity and ecosystem service exists for global climate regulation, pest control, and the regulation of soil quality (Kleemann et al. 2025). Overall positive links between soil biodiversity and ecosystem services outweigh negative links across all three types of ecosystem services: regulation and maintenance, provisioning, and cultural (Kleemann et al. 2025). However, examples of negative links between soil biodiversity and ecosystem service exist for soil taxa that can act as pests in arable systems or disease vectors for livestock and humans (Kleemann et al. 2025). Relationships between soil biodiversity and ecosystem services have been researched primarily for regulating and maintenance services, but less so for provisioning services and cultural services (Kleemann et al. 2025). Moreover, the influence and complex interactions of changes in climate, land use and its intensity, and other global change drivers on soil biodiversity as well as their feedback effects on ecosystem services are hardly known (Beaumelle et al. 2020, Phillips et al. 2024, Rillig et al. 2019). For more information on the links between soil, soil biodiversity, and soil-related ecosystem services, please refer to Kleemann et al. (2025).

6. Human impacts on soils are manifold and often unpredictable in their combinatorial effect on the diversity and performance of soil organisms. There is a great need for more research in complex systems and multifactorial environmental change experiments.

More than 60% of European soils are rated as degraded, often as a consequence of soil erosion or mismanagement (EC - European Commission 2023). It is generally recognized that changes in landscape structure and land use, pollution, climate change, and invasive species are direct drivers of soil biodiversity change (FAO et al. 2020, Phillips et al. 2024). Land-use change and resource exploitation (incl. land-use intensification) and pollution (e.g., by metals, pesticides) are the so far best studied (Fig. 2) and probably the most important drivers of soil biodiversity change (Phillips et al. 2024). However, the direct drivers of soil biodiversity have been studied to varying degrees for different soil organism groups and habitats (Fig. 2), so that the level of knowledge does not necessarily reflect the relevance of a driver (e.g., climate extremes, Phillips et al. 2024). In addition, the driver effect is strongly dependent on geographical factors, in particular climate, inclination, hydrological conditions and soil texture, so that site-specific differences are to be expected. For instance, due to their larger surface areas and stabilised soil organic carbon, clayey soils generally have a higher buffering capacity than sandy soils (Matzke et al. 2009, Tecon & Or 2017, Vos et al. 2013). A general ranking of the various influencing factors is therefore difficult.

Direct drivers of soil biodiversity often do not act in isolation, but typically in interaction with each other (Fig. 3) (Isbell et al. 2023, Rillig 2020, Rillig et al. 2019). This can lead to a strengthening, weakening, or neutralisation of the driver effects. For example, it is generally recognized that intensively managed cropland soils have a particularly detrimental effect

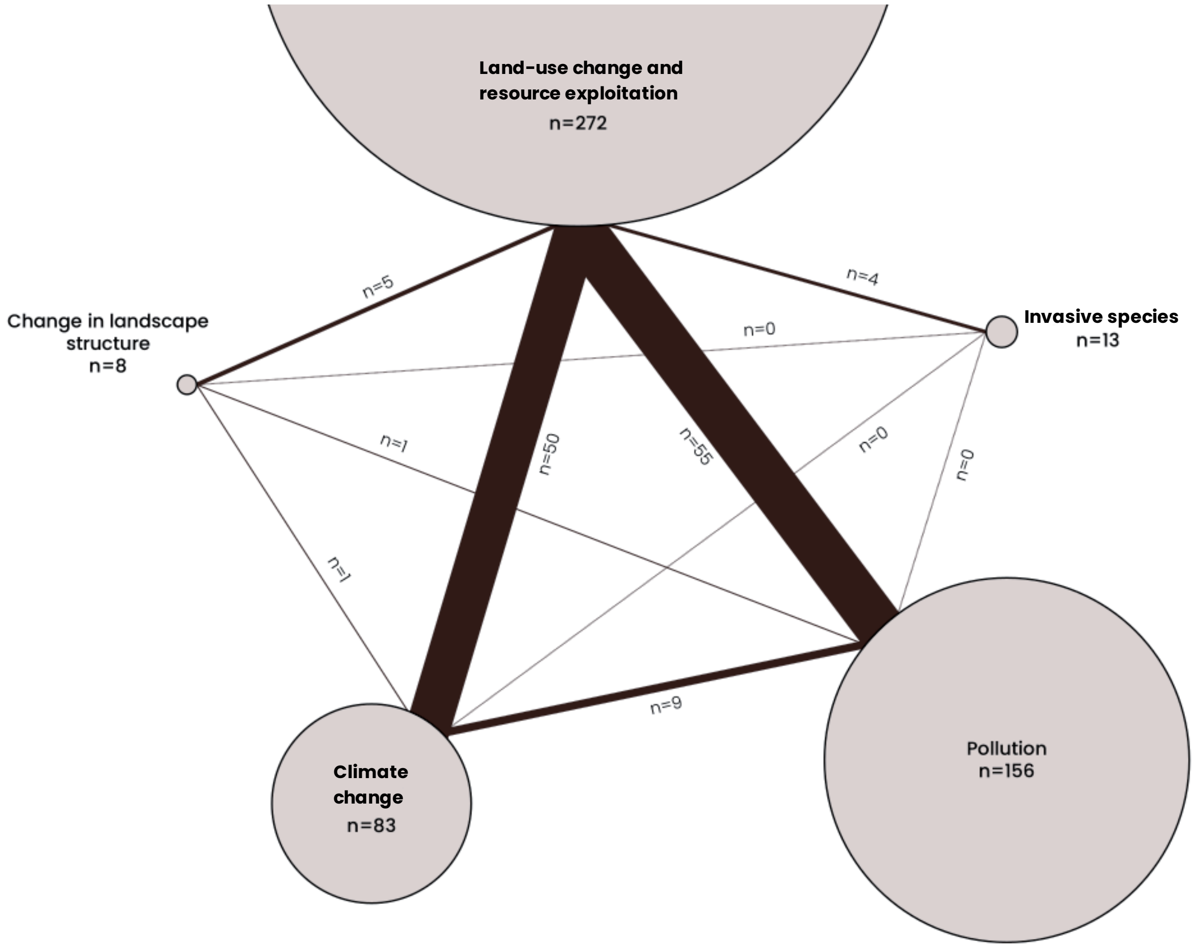

Figure 2. 'Research interest' based on a systematic literature search of direct driver effects on soil biodiversity in Germany. Circles represent the number of publications related to a respective direct driver. Lines represent the number of publications that focus on both respective drivers connected by the line. The size of the circles and lines is proportional to the number of publications. Figure modified from Eisenhauer et al. (2024).

on soil biodiversity and functioning when extreme weather events such as drought occur at the same time (Sünnemann et al. 2023). It can be assumed that drivers or combinations of drivers that influence connectivity and habitat stability in soils also influence soil organisms. However, it is still unclear how specific driver combinations affect soil biodiversity (Rillig et al. 2021). Due to the complexity of the soil system, studies on the cause-and-effect principle are difficult and therefore exist mainly for individual drivers. For example, it remains to be seen whether, in addition to dramatic changes such as soil erosion, there are other tipping points in the system, e.g. triggered by climate change-induced weather extremes, at which biodiversity change is greatly accelerated (Bei et al. 2023). There is a great need for research in complex systems and multifactorial environmental change experiments that can be done either in mesocosm (Rillig et al. 2019) or by field studies (Rillig et al. 2023). Such research is particularly needed with regard to possible climate change-related synergies (Thakur et al. 2018), in order to be able to assess negative or positive consequences for the biodiversity of different groups of soil organisms. For more information on the direct and indirect drivers of soil biodiversity change, please refer to Bartkowski et al. (2025).

7. The policy frameworks were and are not (yet) geared towards the protection of soil biodiversity.

The impact of indirect drivers (Fig. 1) on soil biodiversity has not yet been well studied, as the protection of soil biodiversity has only recently begun to receive the necessary attention in society, politics and the economy (see key message #2, EC - European Commission 2023). For this reason, causal relationships between changes in soil biodiversity and the impact of indirect drivers are hardly documented. In the political-legal sense, soils are erroneously regarded as static systems (Gonzalez Lago et al. 2019). Soil biodiversity has hardly been considered in assessments in Germany or in Europe and therefore receives little attention in current nature conservation policy. The few existing German and European legal texts relating to soils are inadequate in terms of effective soil protection, in particular for the conservation of soil biodiversity (Köninger et al. 2022). Current plans to implement (e.g., EU Directive on Soil Monitoring and Resilience (EU SML) or the Nature Restoration Regulation) or reform soil-related policy frameworks can improve deficiencies of the past. The upcoming EU SML will implement a systematic, harmonized European monitoring and data sharing and evaluation program

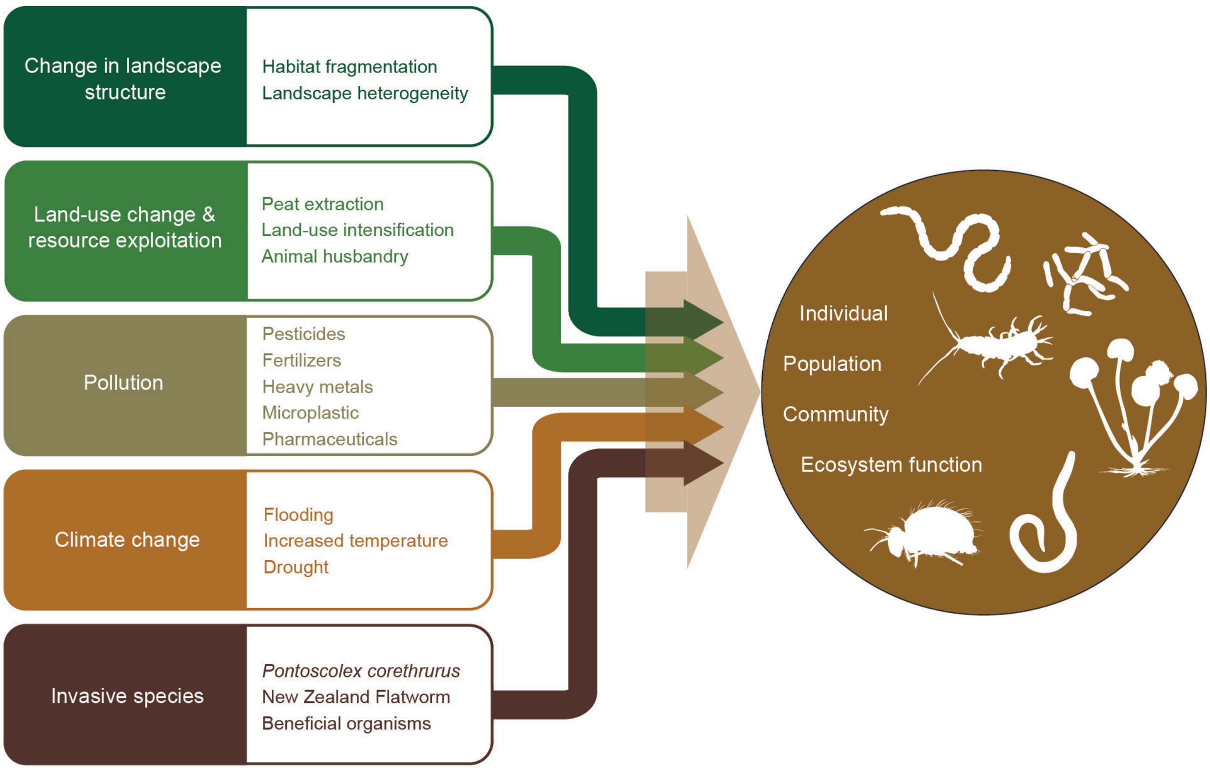

Figure 3. Examples of direct drivers and their effects on different levels/scales of soil biodiversity. Figure modified from Eisenhauer et al. (2024).

for soil health descriptors including soil biodiversity. However, to be effective, such overarching policies need to be channelled into implementation, e.g., through incentives for soil-friendly management. Existing incentive systems at national and European levels, such as agri-environmental and climate measures or eco-schemes under the Common Agricultural Policy (CAP), hardly address soils (Bartkowski et al. 2021) or soil biodiversity (Köninger et al. 2022). At the same time, by setting the boundaries within which land management takes place, the CAP already impacts soil biodiversity (Scherzinger et al. 2024), though in a rather implicit and unsystematic way. There is a need to align the CAP with overarching policy strategies and frameworks, such as the EU Soil Monitoring and Resilience Law and Nature Restoration Regulation.

8. Soil biodiversity benefits from low-intensity land use and management in both protected and unprotected areas.

In protected areas, which so far are exclusively based on the conservation of aboveground biodiversity (Guerra et al. 2022), aboveground-targeted management is expected to also benefit soil biodiversity, which may not always be the case, e.g., when hotspots of aboveground and soil biodiversity do not overlap (Cameron et al. 2019). In general, measures for the protection and conservation of soil biodiversity largely depend on habitat type. In agriculture, the switch from intensive to more extensive/ conservation practices (e.g., reduced ploughing, reduction of pesticides, site-adapted diversified cropping systems, use of organic fertilisers, permanent soil cover, and maintenance of field margins) have positive effects on soil biodiversity (Filser et al. 2025, Phillips et al. 2024). In grasslands, soil biodiversity benefits from increased plant diversity (Eisenhauer et al. 2013, Scherber et al. 2010) and reduced management intensity (e.g., less grazing, mowing) (Phillips et al. 2024). The promotion of native plant species is an important measure in both grasslands and forests (e.g., Kohyt & Skubała 2020). In forests, the establishment of heterogeneous stands of different ages and tree species is also beneficial for soil biodiversity (Ganault et al. 2021). All of this can usually be achieved through an adaptation of management measures, whereas in floodplains, peatlands and salt marshes, an initial stimulus measure (e.g., dyke relocation, rewetting) is usually required for restoration (Günther & Assmann 2005). In urban areas, one-off measures such as unsealing (Renella 2020), the establishment of green roofs and green roadsides (Mody et al. 2020, Schrader & Böning 2006), as well as biodiversity-friendly management of urban green spaces and private gardens (Joimel et al. 2019, Tresch et al. 2019) contribute to the preservation of soil biodiversity. For more information

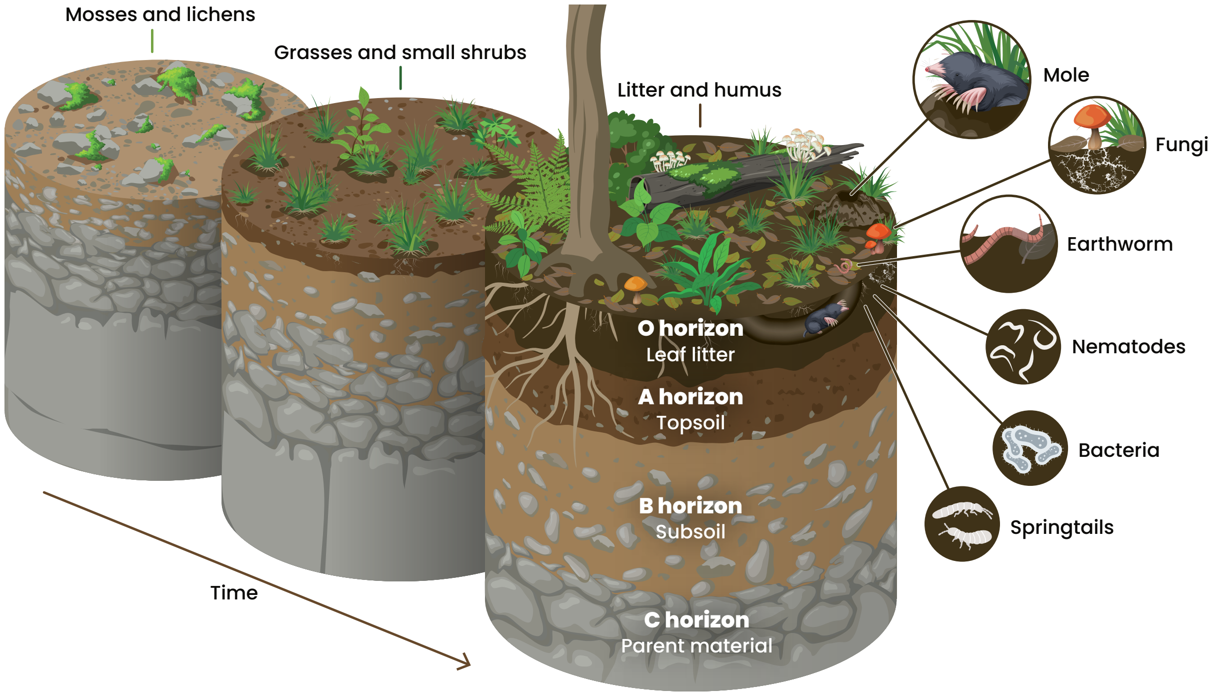

Figure 4. Pedogenesis and the physical and biological components of soils. Pedogenesis is the formation of soil through weathering of bedrock and the decomposition of organic material. Soil biodiversity, from microorganisms, protists, enchytraeids, nematodes, springtails, mites, earthworms (and many more) to other macrofauna, influences pedogenesis and soil formation through their activity in space and time (Angst et al. 2024, Gadd 2010, Kaviya et al. 2019). Figure modified from Eisenhauer et al. (2024).

on potential instruments and measures for the protection of soil biodiversity, please refer to Filser et al. (2025) and Scheunemann et al. (2025).

9. The preservation of non-degraded soils and spatial heterogeneity must have high priority.

Soil protection is the basis for healthy and resilient ecosystems. Due to extremely long soil formation processes (Fig. 4) (ca. 1 cm and less per 100 y, Akca et al. 2024, Verheijen et al. 2009) and the slow formation of complex communities of soil organisms with their indispensable ecosystem functions and services, any soil degradation has long lasting and potentially irreversible consequences. Conversely, given that the dispersal capacity of most soil organisms is very limited (Joimel et al. 2018, Lehmitz et al. 2011, Steiner & Schrader 2002), measures promoting soil biodiversity are likely to be more effective the longer they last (e.g., Eisenhauer et al. 2010). In addition, given their potential to store carbon, the restoration of habitats such as floodplains and peatlands is urgently needed to protect specialised species and maintain the diversity of different soil communities and functions (Lehmitz 2014). It is generally recognized that small-scale habitats and higher plant diversity create diverse niches and are important for soil biodiversity in all land-use types (Brunet et al. 2010, Scherber et al. 2010). Landscape elements such as field margins, species-rich meadows, different heights in peatlands and floodplains (Plum & Filser 2005), or deadwood in forests create habitats for species adapted to the local conditions, which thus also promotes soil biodiversity. The diversity of habitats themselves must therefore also be protected in order to preserve the diversity of different communities and their functions (Vanbergen et al. 2007). It is also generally recognized that soil biodiversity at the landscape level is increased by the coexistence of different habitats (e.g., moors, forests, and open land, Vanbergen et al. 2007).

10. Various stakeholders have direct and indirect influences on soil biodiversity.

Land users have the most relevant direct influence on soil biodiversity as they decide about the management measures of their land (e.g., through the use of pesticides and fertilisers in agricultural fields, decisions on tillage practice, or the removal of deadwood in forests). They have an interest in preserving soil health to make their activities viable in the long term; however, their action space is often severely restricted, e.g., through limited market power, natural variability (pests, drought, etc.), and dependence on infrastructure (Gütschow et al. 2021). Furthermore, their decisions are influenced by numerous other stakeholder groups and their actions, including landowners, who may determine how land is managed; consumers, who demand goods whose production has consequences for soil biodiversity; politicians, authorities, researchers, associations and educational institutions, who determine training content and set guidelines and incentives for soil management. In addition, the civil society influences politicians and decision-makers and can draw (or distract) their attention to the importance of soil biodiversity. The interplay of these different influences determines how soils are managed, which ultimately has consequences for soil biodiversity. Multiple challenges arise in this context. First, many stakeholder groups are not yet aware of the importance of soil biodiversity and their own direct and/ or indirect impacts on soil biodiversity. Second, the diffusion of responsibility and associated social dilemmas present another challenge that further complicates both individual and collective action towards protection of soil biodiversity. This calls for raising awareness and improving knowledge on the importance of soils and their biodiversity; at the same time, awareness and knowledge are known to not be sufficient to trigger action (Albarracín et al. 2024, Toomey 2023), especially when it comes to public goods such as soil biodiversity. Here, there is a need for collective action, coordinated by institutions such as policies or social norms (Ostrom 1990). For more information on the actor groups, their action spaces and options, please refer to Bartkowski et al. (2025).

11. Raising awareness of the importance of soil biodiversity is a key basis for sustainable land use and maintaining/restoring soil health.

Soils and soil organisms are rarely perceived positively by society (e.g., as something valuable and worth protecting) or recognized at all (Phillips et al. 2020, Xylander 2020). The lack of positive associations makes soil and soil life protection more difficult compared to protection efforts in other ecological/environmental sectors. Early life experiences with the living world in the soil are often emotionalising and lasting - constituting a precondition for the willingness to value soil biodiversity in later years and to take care for soil health maintenance (Hoover 2021, but see also van Heezik et al. 2021). Pedagogical concepts for soil awareness and their integration into everyday school life exist, but are still insufficiently implemented in schools and teaching curricula. A central approach for raising awareness is to familiarise young people with the biological diversity of soil through multi-sensory exploration, collecting and touching soil animals, and microscoping, but also smelling soil - combined with an explanation tailored to the target groups. This requires appropriate training for teachers, as well as the development of extracurricular teaching in this area and easy-to-use teaching materials. Universities and education policy have duties here (Xylander 2024). Media presence, museum exhibitions, implementing innovative digital media, and transdisciplinary approaches including artists as well as the integration of citizen science in soil biodiversity monitoring complement sensitization in school education and beyond. For more information on the soil biodiversity awareness in Germany, please refer to Xylander & Glante (2025).

Conclusions

National assessments of soil biodiversity are urgently needed and require the transdisciplinary collaboration of various scientists and stakeholders from all levels of society, from public and private sectors, that consequently can provide the sound foundation for sustainable actions and policy- and decision-making towards biodiverse healthy soils (Guerra et al. 2024). Here, we displayed how such an assessment can highlight the national soil biodiversity, past, current and future drivers, and existing knowledge gaps while also highlighting the multiple possible avenues of sustainable action for the protection and restoration of soils and soil biodiversity on all societal and political levels. However, a long-term systematic national monitoring, based *inter alia* on a national assessment, is required to fill in highlighted gaps, update the knowledge on state and trends, and integrate soil biodiversity in conservation activities and regulations.

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