**[Soil biodiversity and its contribution to ecosystem services](https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-miss-2022-soil-01-03;callCode=null;freeTextSearchKeyword=soil;matchWholeText=true;typeCodes=1,2,8;statusCodes=31094501,31094502,31094503;programmePeriod=null;programCcm2Id=null;programDivisionCode=null;focusAreaCode=null;destination=null;mission=null;geographicalZonesCode=null;programmeDivisionProspect=null;startDateLte=null;startDateGte=null;crossCuttingPriorityCode=null;cpvCode=null;performanceOfDelivery=null;sortQuery=sortStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState)**

**HORIZON-MISS-2022-SOIL-01-03**

Call for proposalGrant

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| **Programme** | Horizon Europe (HORIZON) |
| **Type of action** | HORIZON Research and Innovation Actions |
| **Opening date** | 12 May 2022 |
| **Status** | **Open for submission** |
| **Deadline model** | single-stage |
| **Deadline date** | **27 September 2022** 17:00:00 Brussels time |

**Budget per project:**  **8 mil. €** (The total indicative budget for the topic is EUR 16.00 mil.)

**ExpectedOutcome:**

This topic contributes to the objectives and targets of the EU Soil Strategy which foresees that by 2050, all soils in the EU should be healthy, i.e. are in good chemical, physical and biological conditions, and thus able to continuously provide as many ecosystem services as possible. It also contributes to the Mission ‘A Soil Deal for Europe’, in particular to its specific objective 6 “Improve soil structure to enhance habitat quality for soil biota and crops”.

Project results should contribute to all of the following outcomes:

* Significantly improved understanding of ecosystem services related to soil biodiversity as well as of the role of soil biodiversity in the provision of relevant soil functions and ecosystem services.
* Enhanced protection, sustainable management and restoration of soil ecosystems through more targeted (policy) incentives and wide-spread knowledge on sustainable soil management practices and solutions, including a better integration of soil within land use planning and frameworks to evaluate ecosystem services.
* Significantly improved availability of soil biodiversity indicators which support the implementation, assessment and monitoring of policy at large scale (i.e. EU).

**Scope:**

Soils underpin the delivery of a range of ecosystem services which are essential for the environmental, social and economic wellbeing of people. Many of these services such as the production of biomass for food and other uses, removal of pollutants, support of above-ground biodiversity (e.g. farmland birds), provision of soil structure, nutrient cycling and carbon storage depend on the activities of a fascinating and complex network of soil organisms such as insects, invertebrates, bacterial and fungal organisms.

While our knowledge about individual components of soil biodiversity has significantly increased, the links between soil biodiversity, the multifunctionality of soils and the delivery of ecosystem services needs to be further explored. Furthermore, there is still a need to better understand the overall organisation of soil organisms (e.g. in terms of abundance, species richness, relationships of interdependence, evolution through time and community structure) and how pressures and drivers (including their interactions) resulting from different forms of land use and climate change affect the composition, functions, resilience and adaptation capacities of soil biota and their capacity to support multiple ecosystem services (ES).

**Proposed activities should:**

* Provide a comprehensive view of the composition, functions, and dynamics of the network of soil-living communities (e.g. species distribution, abundance, ecological interactions and belowground-aboveground relationship) under different types and intensities of land use in agricultural, forest, (semi-) natural and urban areas.
* Establish the links between soil biodiversity, soil functions and ecosystem services taking into account potential trade-offs between different ES.
* Propose indicators for capturing and measuring soil biodiversity (beyond red list species) and the provision of ES and demonstrate practical approaches for the use of these indicators by land managers and policy-decision makers.
* Identify drivers and pressures (including their interactions) of soil biodiversity in different types of land use and explore their effects on soil community composition and functioning and how ES provision is altered and hampered as a consequence of these pressures. Due attention should be given to under-studied pressures and drivers, as justified by proposals.
* Provide a framework to assess and value the contribution of soil biodiversity to ES in economic terms, building on existing work including the one undertaken under the initiative “Mapping and Assessment of Ecosystem Services” (MAES).
* Translate the knowledge created into practical applications for land managers and policy-decision makers to increase the uptake of practices that promote soil biodiversity and optimise its contribution to soil functions ES.

In carrying out activities, proposals should consider various land uses such as urban, agriculture, forest, (semi)-natural, wetlands, drylands, industrial and mining, and highlight those types of soils where previous research has shown significant knowledge gaps. With regard to agriculture, work should draw on sustainable practices, applied across a range of farming systems and benefit both conventional and organic farming. Activities should be carried across a range of climatic/biogeographical regions in the EU and Associated Countries and take into account different spatial scales (e.g. field, landscape). Transdisciplinary approaches should be applied and include social sciences and humanities. The project should follow a multi-actor approach.

**Eligible countries:**

To be eligible for funding, applicants must be established in one of the eligible countries, i.e.:

– the Member States of the European Union, including their outermost regions;

– the Overseas Countries and Territories (OCTs) linked to the Member States;

– eligible non-EU countries: - countries associated to Horizon Europe;

- low- and middle-income countries

**Eligible partners:**

Proposals must apply the “**multi-actor approach**”, thus ensure a balanced mix of actors from various sectors and include **expertise from behavioural and social sciences**.

**Affiliated entities** — Affiliated entities are eligible for funding if they are established in one of the countries listed above.

**EU bodies** — Legal entities created under EU law may also be eligible to receive funding, unless their basic act states otherwise.

**International organisations** — International European research organisations are eligible to receive funding. Unless their participation is considered essential for implementing the action by the granting authority, other international organisations are not eligible to receive funding. International organisations with headquarters in a Member State or Associated Country are eligible to receive funding for ‘Training and mobility’ actions and when provided for in the specific call conditions

**CONCEPT NOTE (UPJS):**

In Europe, some scree accumulations with perennially cold microclimates are commonly known as **ice-bearing taluses** or **cold/freezing screes**. This phenomenon has been documented on hills and mountain slopes. Analogous conditions may be found in limestone deposits spread across low to middle altitude karst landforms, such as collapse dolines of ice caves or the cold bottoms of deep gorges and valleys that have historically experienced a periglacial climate and thus can serve as unique refugia for cryophylic (psychrophilic) invertebrates, especially in terms of the ongoing climate change. The climatic conditions inside cold screes are often characterized by a **strong thermal inversion.** The specific air flow passing through the interstitial voids leads to the development of a highly conservative and stable cold microclimatic regime in the lower parts of the scree slope, potentially resulting in the formation of solid ice or sporadic permafrost. In the winter months, the thermal contrast between the internal scree accumulation and the external air creates a “chimney effect” that leads to the warming of the scree top, while the bottom remains constantly and strongly subcooled and shows high values of soil moisture throughout the year. Moreover, many other factors, such as topography, altitude, sun exposure and vegetation cover, contribute to the differences in the microclimate between the bottom and the top of the scree slope.

It is known that periods of the year affect the basic ecological attributes of arthropod assemblages in scree slope habitats, such as richness and abundance, which often positively correlate with temperature. Furthermore, the scree microclimate has also been suggested as being an important factor affecting the vertical migration of invertebrates from the surface deeper into scree habitats with microclimatically stable conditions to avoid a harsh external climate, resulting in the formation of specific community patterns and their dynamics along a depth gradient in scree slopes. The **availability of organic carbon content** along the depth gradient is another crucial limiting factor in soil habitats. The presence of vegetation and the amount of leaf litter and humus on the surface contributes to nutrient resources in the screes and may significantly influence the biodiversity patterns in this habitat.

Habitats that remain humid during the whole year, such as protected gorges, dolines or cold scree deposits, may experience the greatest thermal stability and resilience to climate changes and thus can provide long-term shelters (refugia) for arthropods sensitive to temperature fluctuations, especially cold-adapted/psychrophilic taxa. It is important to note that scree habitats with inversed microclimatic conditions are vulnerable environments, where **global warming** may lead to the loss of relict forms of invertebrates and consequently to the reduction of biodiversity in these unique natural habitats. Thus, preservation of these karst landforms and their sensitive soil biota should be a central part of **biodiversity conservation programs**.

In this call, we would like to focus our attention on **(1)** comparing diversity, vertical stratification and community structure of soil invertebrate groups at several different sites with microclimatically inversed conditions (forest, karst, urban) for instance in different year periods, **(2)** analyses responses of soil organisms regarding their affinities to climate conditions in the given periods, and **(3)** assessing the function of selected areas as potential climate refugia for psychrophilic forms of soil biota.

In this study we will provide comprehensive overview of the species compositions, networks / relationships between soil communities in different areas with microclimatically inversed conditions. Also affect of soil-chemical parameters such as pH, organic carbon content, nitrogen in relation to depth layer on soil and scree invertebrate communities will be evaluated.

**Another approaches:**

Measure ecosystem services from soil health indicators - organic matter, bulk density, aggregate stability, greenhouse gas flux from the soil surface and **soil biodiversity.**

Monitoring the decline in soil biodiversity by set of suitable indicators (effective and sensitive to detect change across a range of land-use categories at a European scale to provide the basis for a harmonized, comprehensive soil and land information system for monitoring in Europe.

politically, basic requirements for soil protection in the EU have to be agreed on; i.e., the SFD has to be adopted.

scientifically, define details of the monitoring program.

practically, perform systematic sampling needs across the EU on main land-use and soil-type categories to derive baseline and threshold values for soil biodiversity.