URSOiLL

D1.1 Stakeholder mapping and baseline analysis of local ecosystems

31st March 2026

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under review

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R = Document, report

DEC = Websites, patent filings, video, etc.

DATA = data sets, microdata, etc.

DMP = Data Management Plan

SEN = Sensitive, limited under the conditions of the Grant Agreement

PU = Public, fully open, e.g., web (Deliverables flagged as public will be automatically published in CORDIS project's page)

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List of Abbreviations

CCS	Co-creation session
EL	Greece
ES	Spain
HSLL	Health Soil Living Lab
IT	Italy
LL	Living Lab
LU	Luxembourg
NbS	Nature-based solution
PESTLE	Political, Economic, Social, Technological, Legal, Environmental
SE	Sweden
STK	Stakeholder
WP	Work Package

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Project Summary

In the face of rapid urbanization, with 70% of the global population expected to live in cities by 2050, urban soils have become critical in providing essential ecosystem services supporting healthy urban ecosystems. Indeed, the ecosystem services that urban soils provide are essential for regulating the carbon and water cycles, mitigating flooding risk and heat islands, provide provisioning services, such as supporting biodiversity and urban food production, and enhancing urban green spaces that improve mental and physical well-being, and landscape aesthetics.

Despite their importance, urban soils are often degraded by anthropogenic activities, including sealing, compaction, contamination with heavy metals and other pollutants, which hinders their ability to provide ecosystem services. This degradation poses risks to human and environmental health and worsens the effects of natural disasters like floods and heatwaves.

In this context, **URSOILL aims to address these challenges by establishing a network of five urban Living Labs (LLs) where local stakeholders (scientists, communities and authorities) can collaborate to co-create, test, and implement practical innovative solutions for urban soil restoration and protection.** Each LL will focus on improving soil health, enhancing ecosystem services, and promoting sustainable land management using innovative technologies and nature-based solutions (NbSs).

By placing urban communities at the core, the project ensures that the solutions developed are not only scientifically validated but also socially and economically viable. The co-creation of solutions in real-world settings will allow for effective knowledge transfer, fostering long-term cooperation and facilitating the replication of successful practices in other urban areas. By restoring urban soils and enhancing their capacity to deliver essential ecosystem services, URSOILL will help cities become more climate-resilient, sustainable, and liveable.

Work Package 1 (WP1) “LLs: Conceptualisation and co-creation with stakeholders to promote participation and soil literacy” aims to support the development of the URSOILL LL by refining their conceptualisation (Task 1.2), establishing a baseline of local co-creation ecosystems (T1.1) and soil literacy levels (T1.5), coordinating and guiding the organisations of co-creation sessions (T1.3), as well as soil literacy activities (T1.6), and supporting knowledge exchange with other urban actors interested in protecting urban via a dedicated CitySoilHealth Knowledge Forum (T1.4)

This deliverable presents the results of T1.1 “Setting the scene and understanding the LL’s regional ecosystems”, which led a mapping analysis during the first 6 months of the project to develop a detailed understanding of the regional ecosystems across the five LLs, in order to have a good foundation and proper contextualising for the exchanges and collaborative initiatives within the LLs as part of their URSOILL journey.

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Summary of Deliverable

URSOILL proposes to develop a network 5 Living Labs in urban areas for healthy soils. Located in in Sweden (Humid Continental), Spain (Atlantic), Italy (Alpine), Greece (Mediterranean), and Luxembourg (Continental), the labs represent Europe's diverse climatic and socio-economic contexts. They serve as real-life, interactive innovation-ecosystems where local authorities, scientists, representatives of the civil society and the private sector come together to develop, test, and implement solutions for urban soil restoration. The Living Labs are supported in their co-creation processes by WP1 and started the project by developing an initial baseline.

This deliverable, D1.1 "Stakeholder mapping and baseline analysis of local ecosystems" presents this work. It builds on partners' existing work and networks to map key actors and analyze the local ecosystems expected to engage in the 5 URSOILL Living Labs and their co-creation journeys. It provides a foundation to properly contextualize and localize co-creation efforts within each Living Lab and is linked to Task 1.1.

The report is structured as follows. Section 1 presents the overall mapping methodology and phases. Section 2 then discusses the main results by clarifying the Living Labs' co-creation ecosystems (2.1): URSOILL sites, soil-health challenges and envisaged solutions (2.1.1), the stakeholder ecosystems that need to be mobilised around them (2.1.2 for the overview and 2.1.3 for detailed mapping per LL), and the emerging ladders of "importance" and "influence" (2.1.4), followed by the related barriers and opportunities (2.2), analysed using a PESTLE format.

Between October 2025 and February 2026, T1.1, led by POLIMI, implemented a set of complementary steps to develop a robust and iterative mapping of sites and stakeholders for the URSOILL Living Labs. Partners first identified and mapped experimental sites and stakeholders using a shared actor definition that distinguishes categories, levels and roles, based on the Healthy Soil Living Lab (HSLL) framework developed by POLIMI. The HSLL framework will be further detailed in D1.2. For each site and each individual stakeholder, standardized profiling sheets captured the main soil-health challenges and envisaged solutions, stakeholder type, area of action, relationship to soil health, type and status of engagement with the Living Lab, and initial expectations or concerns, ensuring comparable information across the territories of the LLs. A first cross-Living Lab co-creation workshop, held on 5 December 2025, was used to validate and refine this initial mapping. The feedback loops from this workshop generated key recommendations for each Living Lab and illustrated how stakeholders themselves reshaped the understanding of local ecosystems (summarized in Annex 1: Dec 05, 2025 - Sensemaking reports post cross-LL co-creation workshop.). Finally, between February and March 2026, a PESTLE scan was carried out for each Living Lab, using the mapped stakeholders as key informants to identify the main political, economic, social, technological, legal and environmental factors conditioning local co-creation dynamics.

The results of these activities are presented as an overview of the emerging ecosystems of co-creation in each Living Lab:

1. **Who and where?**

   A presentation of the co-creation ecosystem for each Living Lab, including the experimental sites and the stakeholders to be mobilized around the associated

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soil-health challenges and solutions, supported by data visualizations that show their distribution, positioning and roles within the local ecosystem.

2. **What can motivate or hinder the co-creation journey?**

   An initial sense-making of the stakeholder mapping in terms of impact, influence and interest in joining the Living Lab journeys. The report presents "ladders" of impact, influence and interest as reference tools for future engagement, highlighting which actors are central, which are currently marginal but potentially strategic, and where gaps remain to be addressed in forthcoming engagement cycles.

3. **What barriers and opportunities does each Living Lab foresee?**

   A PESTLE analysis for each Living Lab, based on at least 25 key actors involved in the first local co-creation events, capturing the political, economic, social, technological, legal and environmental factors that shape local co-creation opportunities and constraints.

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1. The Living Labs & Stakeholder mapping methodology

This section presents the initial methodology adopted in URSOILL WP1 for the implementation of Living Labs and stakeholder mapping activities aimed at establishing a robust baseline for Healthy Soil Living Labs. URSOILL WP1 methodology is grounded in the Healthy Soil Living Lab (HSLL) conceptual framework developed by Politecnico di Milano (POLIMI), with the experimental sites profiling criteria further informed by the findings and categorisations used in the SPADES project[1]. Articulated in 2 phases (see Figure 1) the methodology is designed to create a shared and comparable baseline across all sites and to guide partners through a structured sequence of activities, from context analysis and site profiling to the launch of local Living Labs, in line with the HSLL framework[2].

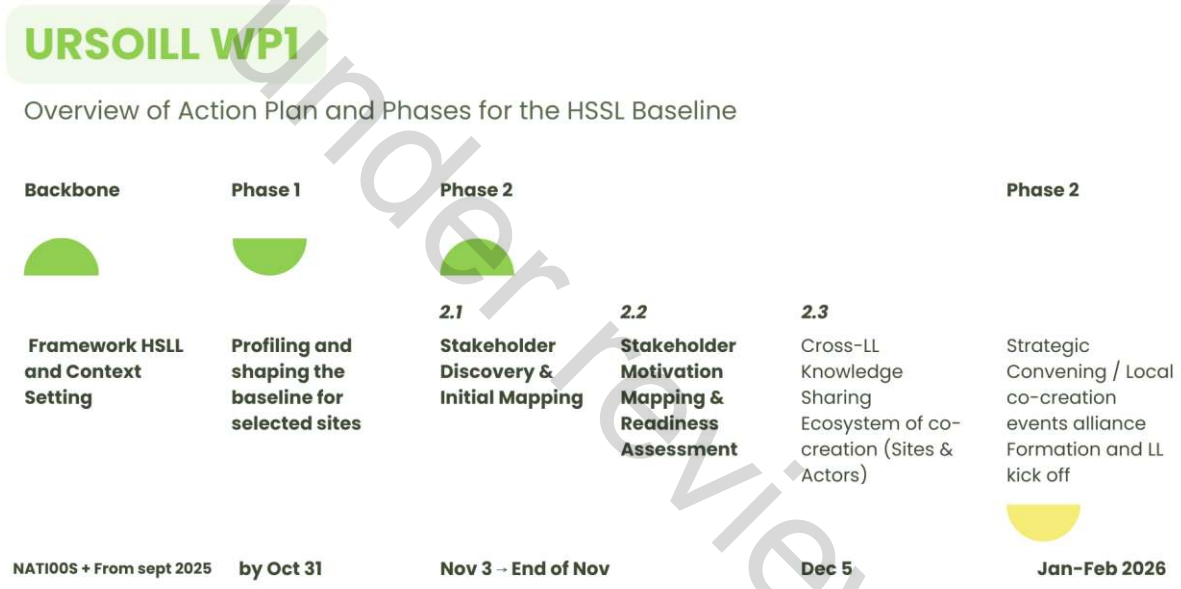

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Figure 1 WP1 sites and stakeholders mapping action plan

1.1. The Backbone phase: Healthy Soil Living Lab (HSLL) mapping framework

The backbone phase established the overarching framework for stakeholder mapping and clarified the contextual dimensions that made prior profiling of experimental sites necessary, so that stakeholder inquiries could be tailored and meaningful. During this phase, WP1 leader iUE together with T1.1 lead Politecnico di Milano – POLIMI agreed to anchor the mapping in the principles of the HSLL framework for urban environments, developed by POLIMI researchers, and

[1] Spatial Planning and Design with Soil (SPADES) is a Horizon Europe project (Grant agreement ID: 101146122) that investigates the integration of soil in planning, in which iUE and POLIMI are consortium partners.

[2] The Healthy Soil Living Lab Framework, as the key concept behind the design and implementation of URSOILL five living labs will be further detailed in D1.2 "URSOILL Living Lab Methodology".

to draw on the preliminary framework developed by the SPADES project for integrating soil health into spatial planning, where soil health is a sum of soil quality, soil quantity and soil performances (ability to perform key functions and ecosystem services)[3], as well as types. They defined key thematic dimensions and a minimum set of indicators and descriptive variables to ensure, on the one hand, comparability across sites and, on the other, a shared approach to data collection that could capture the diversity of stakeholders to be engaged.

This phase produced a common reference architecture centered around 10 HSLL components (Alert Spaces, Aims, Actions, Attributes, Allies, Agents, Activation Strategies, Adversaries, Adjustment Zones and Appraisal – see Figure 2) that enabled each URSOILL Living Lab to apply consistent criteria when profiling sites, selecting experiments, and mapping stakeholders, while remaining flexible enough to respond to local conditions and to the objectives of the Soil Mission.

Figure 2 A conceptual framework for designing Healthy Soil Living Labs (HSLL) for urban environments.

1.2. Phase 1: site profiling and baseline shaping

Phase 1 operationalized the common framework at the level of individual sites. Each LL Leader developed a structured profile for its selected Living Lab areas, using a shared Excel template that integrated the HSLL inquiry (see Figure 3). The template focused on a limited but targeted set of indicators, namely: land-use situation and soil alert spaces; soil quality and soil quantity challenges; envisaged experimental solutions; size and typology of the areas of interest and intervention; and key attributes of implementation (see Table 1 for the list of profiling indicators).

LL Partners[4] first described the current (and, where applicable, future) land-use type of the experimental site, selecting from a common list that included, for example, contaminated industrial and brownfield sites, urban farming and community gardens, and educational facilities and schoolyards (with other urban typologies and an "N/A" option also available). They then indicated the size of the broader area of interest and, separately, the size of the specific area of

[3] This novel framing of soil health where the performances and services that soil can provide to meet societal demands ('soil performances') are made explicity, is a conceptual approach currently tested in SPADES in an effort to translate the complex term of soil quality (eg. soil multifunctionality) into an explicit term that is more understandable for planners spefically (and non-soil scientists in general). See SPADES Diagnosis Workbook, 2025. Available at: https://spades4soils.eu/documents/spades-diagnosis-workbook

[4] URSOILL beneficiaries who are directly active in one of the 5 URSOILL Living Labs.

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intervention or testbeds, allowing the project to distinguish between the wider Living Lab context and the concrete experimental plots.

On this basis, partners selected the relevant soil quality challenges from a predefined list, such as contamination or pollution, biodiversity or fertility loss, and soil compaction (with additional options for other degradation processes). They also specified the soil quantity challenges present at the site, for instance soil sealing, lack of topsoil, or unused land (e.g. a brownfield or derelict lot).

For each site, partners identified the soil performance challenges that the experiment aimed to improve, using a defined list of soil performance categories. Examples included regulating services such as conserving or increasing organic carbon stocks or improving climate buffering and water regulation; provisioning services such as improving soil structure and habitat quality to support biodiversity; and cultural services such as providing a stable and safe platform for human activities.

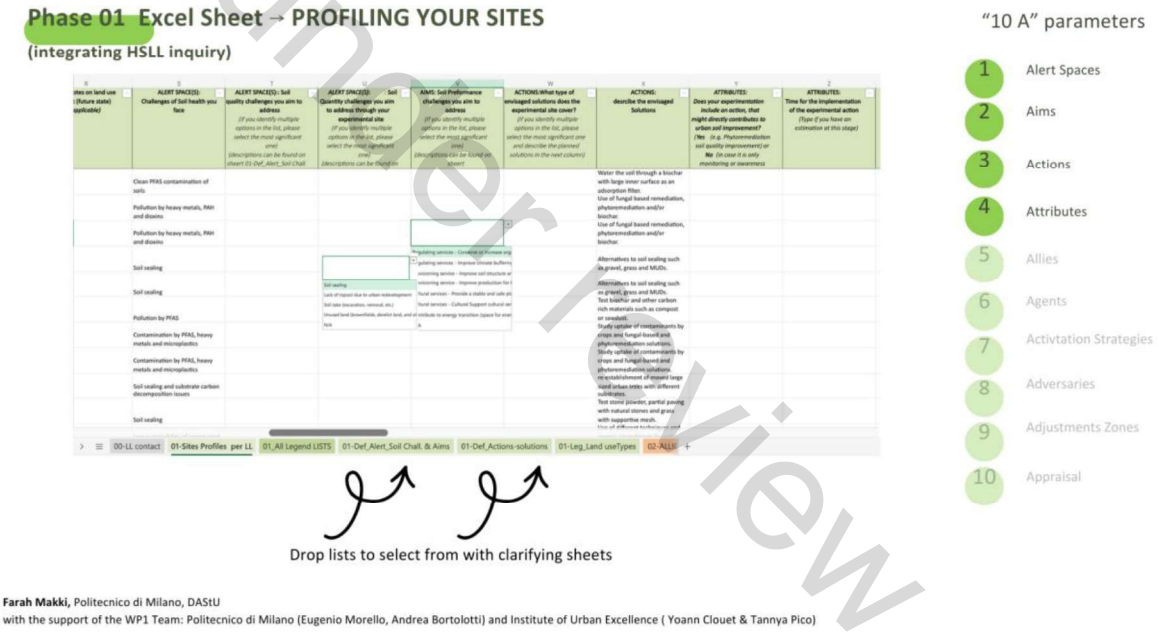

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Figure 3 Template of sites profiling sheets integrating the HSLL perspective and informed by SPADES.

LL partners then selected one or more envisaged solution types from a common drop-down list, for example Circular Soil Management, De-Sealing / De-Paving, and Soil Functional Restoration (with additional options such as Ecological Farming / Agroecology, Engineered Soil Systems, NbS for soil decontamination, Monitoring, Soil Literacy, Regulative or Policy measures, Protection by Coverage, Reforestation / Afforestation, Use Change, and Other). They provided a short narrative description explaining how the chosen solutions were intended to respond to the identified soil quality and quantity challenges and to enhance the targeted soil performance.

Finally, LL partners recorded whether the experimentation included an action that directly contributed to urban soil improvement, distinguishing it from purely monitoring or awareness-raising activities, and estimated the time required for implementation of the experimental action. The outputs of Phase 1 were concise but comprehensive site profiles that

articulated the main soil challenges, intended improvements in soil performance, envisaged solutions, and spatial parameters of the areas of interest and testbeds, together with basic implementation attributes. These profiles constituted the first layer of the HSLL baseline and created a consistent starting point for subsequent stakeholder-focused work.

Table 1 – Unified profiling indicators for URSOILL Sites. Authors: POLIMI & IUE

Land use - category/specific use (current)	**Land Use Typology Classification** (Past & Future)	**Soil Quality Challenge** *(inspired from SPADES)*[5]	**Soil Quantity challenge** *(inspired from SPADES)*	**Soil Performance Challenge** *(inspired from SPADES) + literature)*	**Envisaged solutions** *(inspired from SPADES)*
Contaminated industrial and brownfield sites	Agricultural	Salinisation / Acidification	Soil sealing	Regulating services - Conserve or increase organic carbon stocks	Circular Soil Management
Urban farming and community gardens	Industrial	Contamination / Pollution	Lack of topsoil due to urban redevelopment	Regulating services - Improve climate buffering, including water regulation, flooding, heat stress	De-Sealing / De-Paving
Educational facilities and schoolyards	Green area	Degraded soil nutrient cycling	Soil take (excavation, removal, etc.)	Provisioning service - Improve soil structure and habitat quality to support biodiversity	Ecological Farming / Agroecology
Urban parks and recreational green areas	Residential	Biodiversity / fertility loss	Unused land (brownfields, derelict land, and other underused land)	Provisioning service - Improve production for food, fibre and biomass	Regulative, Normative or Policy
Public squares and small urban spaces	Tertiary	Artificialisation	N/A	Cultural services - Provide a stable and safe platform for human activities	Protection by Coverage
Infrastructure and transport-related spaces	Transport	Soil compaction (degraded soil structure)		Cultural services - Cultural Support cultural services and heritage preservation	Reforestation / Afforestation
Other urban sites	Same	Subsidence risk (degraded soil structure)		Contribute to energy transition (space for energy production/distribution)	Soil functional restoration
N/A	N/A	Flood risk (degraded soil structure)		N/A	Engineered soil systems
		Landslide risk (degraded soil structure)			Use Change
		N/A			NbS for Soil decontamination
					Monitoring
					Soil literacy

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[5] The framework proposed by SPADES applies to all planning scale (urban, peri-urban, rural) and was adapted here to fit specifically to the urban scale

1.3. Phase 2: The stakeholders' mapping

Phase 2.1: stakeholder discovery and initial mapping

Step 2.1 focused on stakeholder discovery and initial mapping across the experimental sites of the Healthy Soil Living Labs. It used a Stakeholder Mapping Framework structured around 16 guiding questions (see Figure 4), organized into five major thematic groups. Every Living Lab was invited to identify and profile at least 60 stakeholders during this phase, ensuring a broad coverage of the local governance and actor landscape before any prioritization took place.

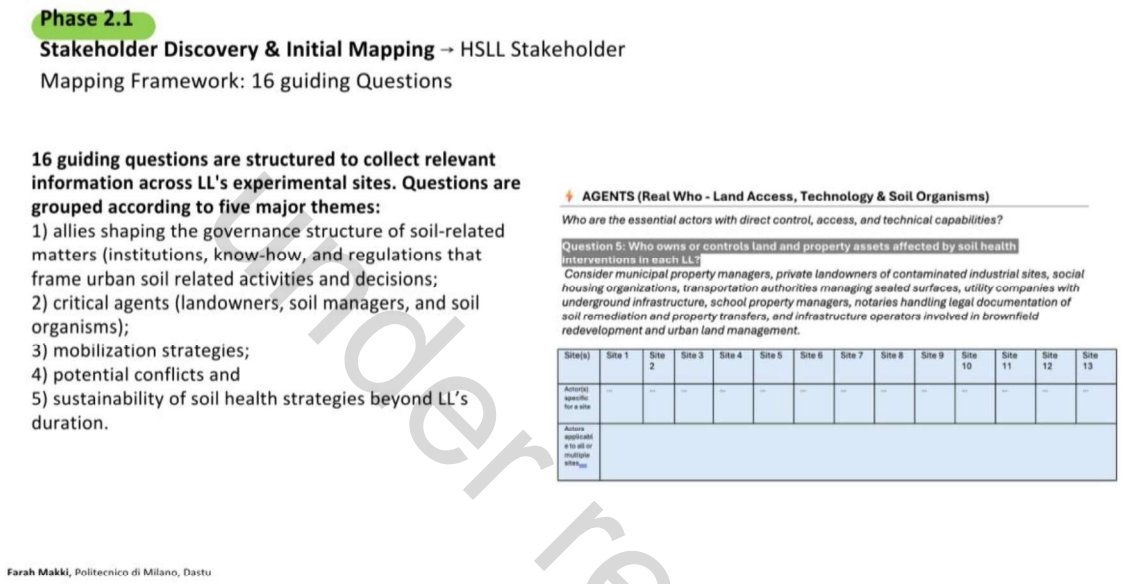

Figure 4 The stakeholders mapping guideline embedding the HSLL perspective.

First, partners identified *Critical Allies* shaping the governance structure of soil-related matters, including institutions, knowledge holders, and regulatory bodies that frame urban soil activities and decisions. Second, they mapped *Agents* such as landowners, soil managers, and other actors directly influencing soil use and management at the selected sites. Third, they examined existing and potential *Activation Strategies*, looking at how different actors could be mobilized, connected, or empowered to support HSLL objectives. Fourth, the framework prompted partners to identify *Adversaries* and *Adjustments Zones* surface potential conflicts, including competing land-use claims, regulatory tensions or diverging interests that could affect soil restoration efforts. Fifth, it addressed the *Sustainability* of soil health strategies beyond the duration of the Living Lab, by identifying long-term stewards, institutional anchors, and resource pathways.

Taken together, the 16 questions ensured that the stakeholder discovery process went beyond a static list of actors and instead produced an initial map of governance structures, power relations, alliances and risks that could inform subsequent engagement and co-creation steps.

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Figure 5 The inquiry logic of the stakeholders mapping guideline integrating the HSLL perspective.

Phase 2.2: profiling stakeholders and their motivation

Phase 2.2 focused on profiling stakeholders in a structured way through a shared Excel sheet (see Table 2), to assess their relevance, power, interest, and readiness to engage in the Living Labs. The template combines basic contact information with analytical fields aligned with the HSLL allies-mapping logic, PESTLE categories, and a motivation–impact–influence framework.

The first set of columns captured the identity and location of each stakeholder, including Living Lab country, organization or stakeholder name, contact person, role or job title, website, email, phone number and city and country. A second group of columns classified the type of stakeholder, first by institutional entity type (using the HSLL allies framework to distinguish, for example, core partners, enablers, challengers or evaluators) and then by PESTLE category to indicate whether they were primarily political, economic, social, technological, legal or environmental actors.

The sheet then documented the current relationship and engagement status of each actor. Partners indicated whether stakeholders were already engaged in urban soil health at the LL location, described their own relationship with them, and selected an engagement status from a drop-down list (not contacted, contacted and waiting for reply, interested, committed, resistant). They also rated each stakeholder's position towards URSOILL objectives, provided a brief description of the organization's main fields of work and activities, and scored the importance of their participation in the Living Lab on a scale from 0 to 4, indicating the sites (or "all") for which the actor was relevant. Additional cells allowed for narrative explanations on why each stakeholder was considered important and for site-specific notes on their role.

To support power, impact and interest analysis, the template included dedicated columns for how affected each stakeholder was by the outcomes of the Living Lab and the selected sites of intervention, with a qualitative description of the type of impact, including potential benefits and risks. Stakeholders' power or influence over soil-health outcomes was rated from 0 to 4, accompanied by an explanation of how and why they could enable or block actions at the

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experimental sites. Similarly, partners rated stakeholders' interest in soil health and motivation to engage (0–4), explaining the nature and source of this interest, what aspects of soil health they cared about, and which individuals within the organization were interested.

General Information about the stakeholder											
Living Lab Country	Organization/Stakeholder name	Contact Person Name	Location_ City	Location_ Country	Stakeholder Entity Type	Stakeholder Entity Type: Based on the Health Soil Living Labs (HSLL) framework and its allies mapping logic	Type of stakeholder (PESTLE)	Are they already engaged in the topic of urban soil health in the LL location?	What is your relationship with the stakeholder?	Engagement Status	How would you rate their position towards the URSOILLs objectives ?

Importance of engagement / site				Affectedness, Impact, Power, Interest				Critical actors, enablers and barriers			
How important do you consider their participation in the living lab? (0 = not important at all, 4 = very important)	Indicate the sites for which this stakeholder is important.	Why do you consider them as an important actor / stakeholder?	Site specific notes about the importance of the stakeholder's participation	How affected is the stakeholder by the outcomes of the living lab and selected sites of intervention?	Impact - How is the stakeholder affected by the outcomes of the LL or the selected sites of intervention?	Power/Influence - How would you rate the stakeholder's ability to influence soil health in the living labs? (0 = no power, 4 = very high power)	Interest - How important is the issue of soil health in this area to the stakeholder and how much does it motivate their LL involvement? (0 = not interested, 4 = very interested)	Identify the actors who are hardest to engage but essential for the Living Lab: they might require special outreach to ensure their participation (Yes, No, Not sure).	Identify the most collaborative actors who should be involved first in the Living Lab; they can help encourage others to join (Yes, No, Not sure).	What barriers or obstacles are stopping, or could stop, stakeholders from joining the Living Lab and taking part in co-creation activities?	What opportunities or supports could motivate stakeholders to take part in the Living Lab and co-creation activities?

Table 2 The type of data input required from LLs for the stakeholders profiling database.

Finally, the sheet recorded engagement challenges and opportunities. Partners identified actors who were hard to engage but essential for the Living Lab, showing the need for tailored outreach, and those who were highly collaborative and should be involved first to help mobilize others. Additional columns captured perceived barriers (political, economic, environmental, social, technological or other) that could hinder participation, as well as opportunities and supports that might motivate involvement in co-creation activities. The template explicitly acknowledged that partners might initially have only partial information and encouraged iterative updates as relationships evolved.

Together, these entries translated local knowledge into a comparable analytical dataset, enabling the project to understand stakeholder ecosystems across the five Living Labs, feeding into the of design targeted engagement pathways and monitor changes in relationships, power and interest over time as part of the implementation of the co-creation process in T1.3.

1.4. Cross Living-Lab co-creation, gap analysis and ecosystem formation

Phase 2.3 consisted of a single cross-Living-Lab co-creation workshop (organised on World Soil Day - 5 December 2026) designed to give visibility to the emerging URSOILL regional ecosystems of co-creation. During this workshop, partners jointly reviewed their stakeholder mappings to identify loopholes and missing actors, with particular attention to under-represented groups, power imbalances, and gaps in knowledge or implementation capacity. The session also created space to explore specific local outreach needs, discussing which actors were hardest to engage,

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which barriers they might face, and which communication channels or intermediaries could be most effective. Tailored post-workshop summaries were prepared for each Living Lab, outlining key conversation points, enabling factors, barriers, and suggested outreach strategies, with the aim of supporting Living Labs in completing and refining their Excel-based mapping of sites and stakeholders (shared in Annex 1).

This first cross-LL workshop helped to make visible how the local constellations of actors together form broader URSOILL regional ecosystems, fostering early connections, shared learning, and mutual awareness between Living Labs.

Based on this motivation–impact–influence matrix, each Living Lab was requested to prioritize at least 25 stakeholders from the long list as key actors to be invited to their first co-creation session (CCS1 organized as part of T1.3 in February 2026 – reported in D1.3), namely the strategic convening and Living Lab launch. This prioritization ensured that the initial co-creation events brought together a balanced mix of core partners, enablers, critical voices and affected groups, while remaining manageable in size for meaningful dialogue and joint planning.

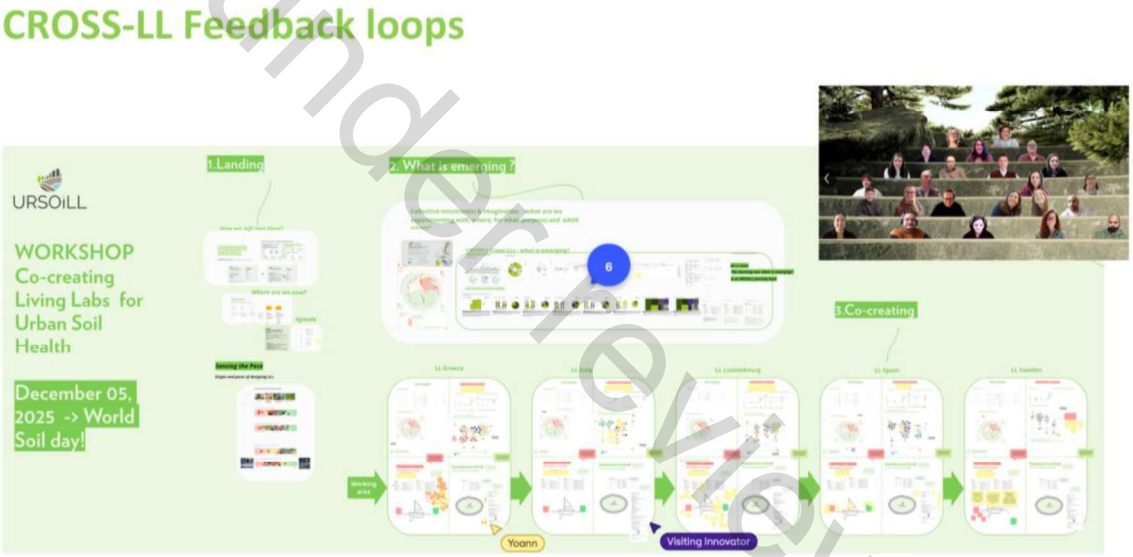

Figure 6 Overview of the digital collaborative workshop space, used during the cross-LLs knowledge exchange and cocreation on December 5, 2025

1.5. Perceived barriers and opportunities of actors - PESTLE

The final component of Phase 2 used the generated baseline and stakeholder insights to organize strategic convenings in each territory, as the first co-creation sessions (CCS) of T1.3.

- Luxembourg LL CCS1: 10th February 2026
- Greece LL CCS1: 16th February 2026
- Spain LL CCS1: 20th February 2026
- Italy LL CCS1: 23rd (focused on Milano's stakeholders) and 27th (focused on Torino's stakeholders) February 2026
- Sweden LL CCS1: 26th February 2026

These events served to present URSOILL and the experimental sites engaged in addressing urban soil health in local ecosystems, to share stakeholder mappings and motivation assessments with

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local actors, to start shaping alliances around shared Soil Mission objectives, to collect interest in joining the co-creation process, and to convene the prioritized set of at least 25 key stakeholders for the first rounds of co-creation as part of T1.3. They also provided the basis for directly assessing stakeholders' perceptions of barriers and opportunities (PESTLE) for the Living Lab journey and cycles of experimentation, including expected contributions from key stakeholders and links to the wider URSOILL objectives. They will be reported on in more details as part of D1.3.

POLITICAL *What political factors shape the way land, soil, and green spaces are managed?*	**ECONOMIC** *What economic pressures or opportunities influence soil and land use?*	**SOCIAL** *What does the community of end-users (notably residents) need, expect, or struggle with?*
TECHNOLOGICAL *Which technological tools or barriers affect soil and city planning?*	**LEGAL** *Which laws, standards, and permits enable or restrict action?*	**ENVIRONMENTAL** *Which environmental conditions shape risks and opportunities?*

Figure 7 Template of PESTLE Analysis provided to LLs – Identifying Challenges & Opportunities for Healthy Soil in Urban Living Environments

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At the conclusion of this 2-phase process, URSOILL Living Labs are not only conceptually defined but also institutionally anchored and socially grounded, equipped with a robust, multi-dimensional baseline, a clearly articulated stakeholder ecosystem, and a set of agreed priorities and initial Living Lab-setting activities. This baseline will directly inform the development of a comprehensive Living Lab Methodology (D1.2) as part of T1.2., and further cross-LL co-creation workshops (focusing on activation strategies and governance). The sites and solutions baseline directly informs the development of WP2 and WP3 where URSOILL experiments are operationalized.

2. Emerging URSOILL Living Labs ecosystem

2.1. Living Labs "co-creation" ecosystems

2.1.1. Overview of sites, soil challenges and envisaged solutions

The emerging URSOILL Living Labs form a diverse ecosystem of experimental sites that collectively address a wide spectrum of urban soil challenges and functions. Across Greece (14 sites), Italy (13 sites), Luxembourg (10 sites), Spain (13 sites) and Sweden (11 sites), more than 60 sites have been selected, ranging from large urban parks and community gardens to small public squares, contaminated industrial plots and infrastructure-related spaces. Together, these sites constitute the spatial backbone of the Living Labs' co-creation ecosystems, offering different

scales, land-use conditions and degrees of transformation potential or impact on urban soil health.

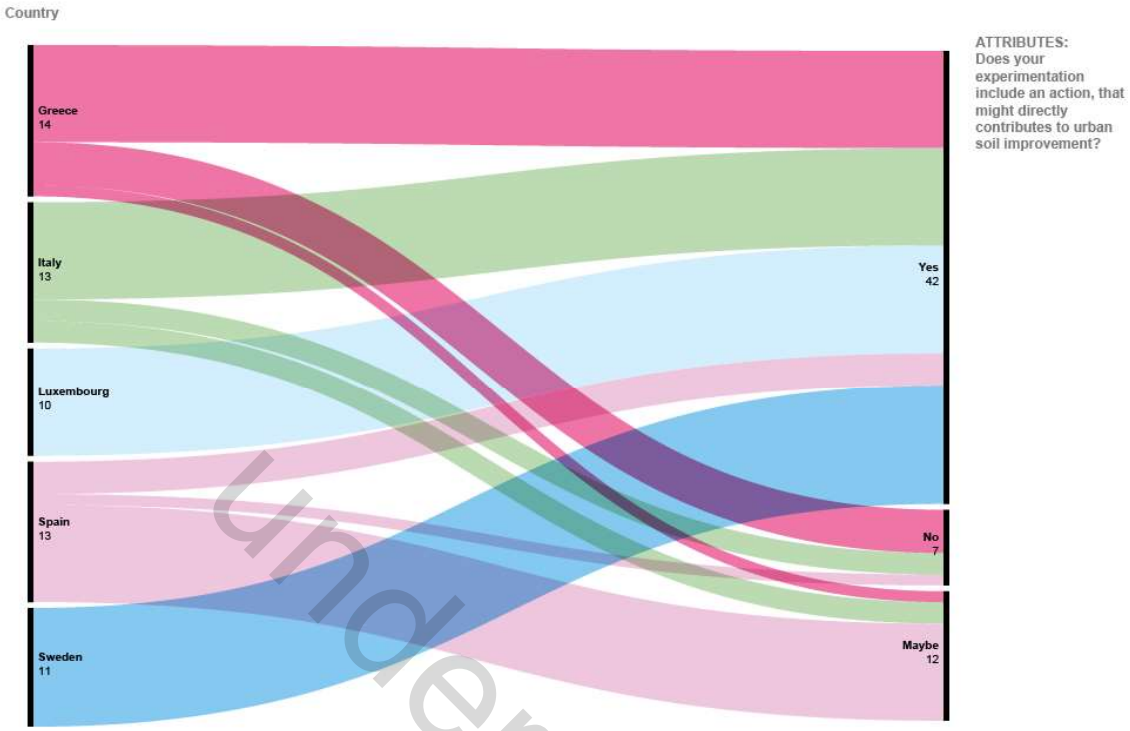

Figure 8 Overview of the number of URSOILL experimental sites declaring a direct transformational action on urban soil health. Source: data from LLs sites' profiling sheets.

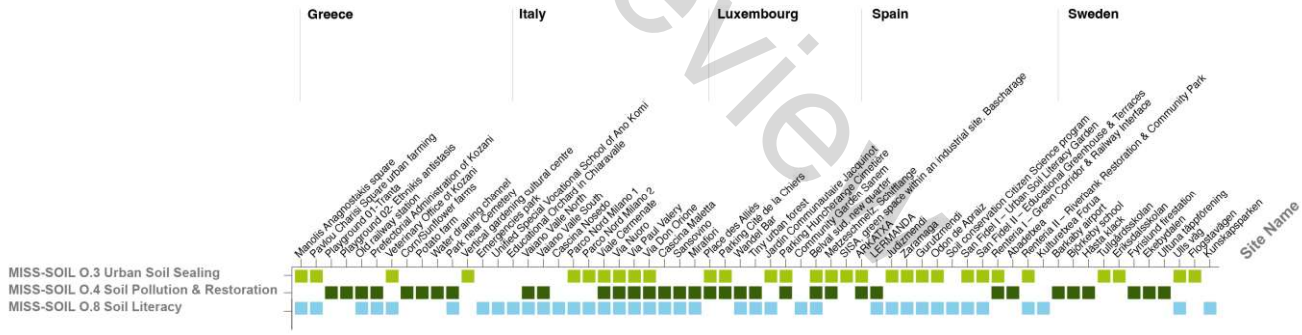

Figure 9 The correlation between URSOILL sites and Soil mission objectives 3, 4 and 8.

From a soil-challenge perspective, three Mission Soil objectives clearly structure the portfolio of sites. 30 sites directly target urban soil sealing (objective 3 of the Mission), opening opportunities for desealing, re-permeabilisation and the creation of new soil-based green spaces. A second cluster focuses on soil pollution and restoration (objective 4), including former industrial or transport-related areas where contamination, degraded soil structure or legacy land uses require remediation and functional recovery. A third group of sites is oriented towards soil literacy (objective 8), using schoolyards, community gardens and public open spaces as demonstration and learning environments to connect citizens, practitioners and decision-makers around soil health.

under review

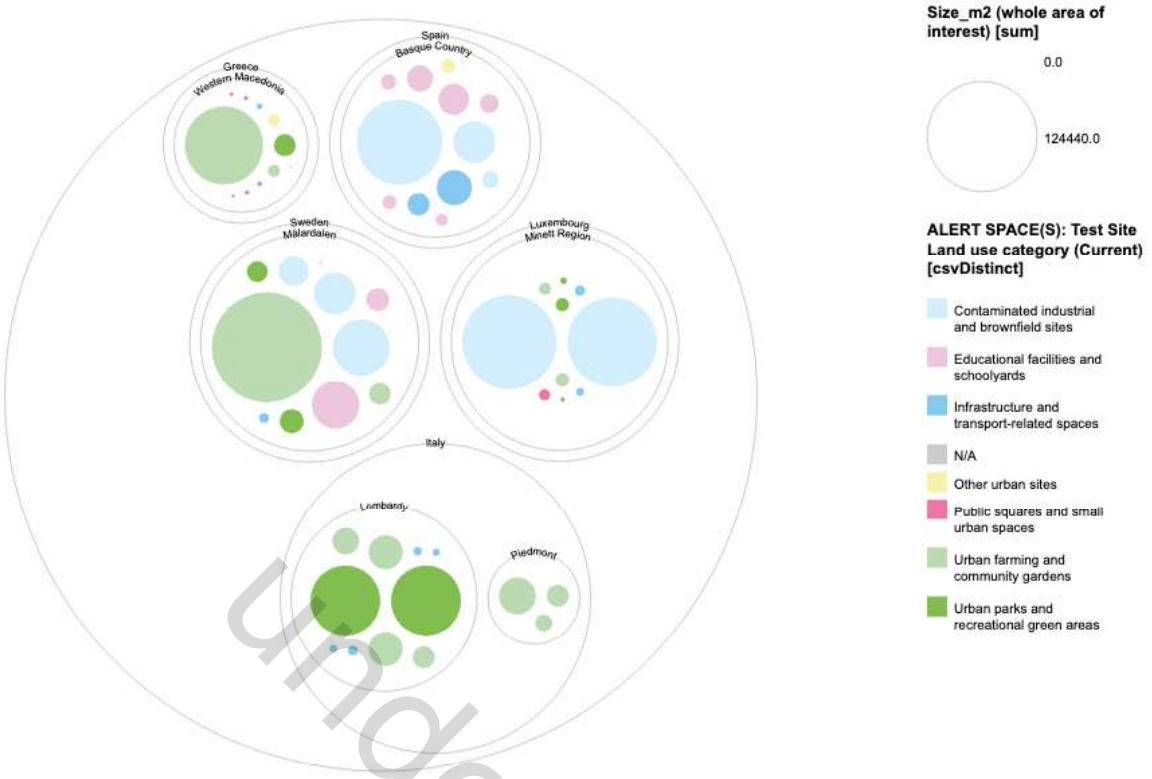

Figure 10 The disaggregation of sites per size of area of interest and land use type.

The envisaged solutions reflect this diversity while revealing several shared directions of change. De-sealing and de-paving, soil functional restoration, soil literacy and nature-based solutions for soil decontamination, emerge as core strategies, often combined with ecological farming or agroecology, and reforestation or afforestation measures. Many experiments are designed not only to improve biophysical conditions but also to enhance key soil performances, such as regulating services (carbon storage, water regulation and climate buffering), provisioning services (habitat quality and biomass production) and cultural services (safe, inclusive grounds for human activates and heritage preservation). For few experimental sites, the portfolio of actions includes structural interventions in land-use and governance or more actions such as monitoring, and pilot engineered soil systems.

Figure 11 The envisaged solutions and desired soil performance restoration per experimental site

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Taken together, the figures (Figures 10-12) show that the URSOILL Living Labs are already forming place-based "co-creation ecosystems" where multiple sites within each region are linked by common soil challenges and complementary solution pathways. Within each country cluster, sites with different sizes and land-use categories are being aligned with shared Mission Soil objectives, creating opportunities for learning across contexts, for example, testing similar desealing or restoration approaches in schoolyards, community gardens and larger parks. The emerging picture is that of a distributed, multi-site experimentation arena in which local actors can co-design, compare and scale solutions for healthier urban soils, while contributing to a coherent European-level learning on how Living Labs can address sealing, pollution and soil literacy in an integrated way and context-relevant manner. This learning process will happen both internally to the project (through cross-LL knowledge exchange), as well as externally, with the set-up of the CitySoilHealth Knowledge Forum (planned as part of T1.4), where external stakeholders interested in the topic of urban soil health will be invited to share and contrast experiences

These 60 experimental sites and envisaged solutions therefore act as the main "anchors" for the next step of the process: identifying who needs to be involved to make these transformations possible. Building on the portfolio of Alert Spaces (the challenged sites) and Actions, the stakeholder mapping zooms in on the institutions, community groups, practitioners, landowners and knowledge holders that are connected to each site and solution pathway. In other words, from this point onwards the focus shifts from where and what URSOILL will experiment with, to who must be engaged, empowered or challenged so that these Living Labs can operate as genuine co-creation ecosystems. This will be the focus of URSOILL D1.2 "Living Lab co-creation methodology".

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2.1.2. Living Labs Stakeholders

For the stakeholders mapping, the HSLL-based 16 guiding questions presented in Section 1.3 were used to deliberately widen the horizons of stakeholder reflection and move beyond the usual "circle of comfort". These questions invited Living Lab teams to look past their immediate partners and consider governance allies, critical land and soil managers, potential adversaries, activation strategies, adjustment zones, and long-term appraisal actors. By systematically working through these questions for each site and envisaged solution, partners expand their view of who is affected, who can enable or block change, and who should be brought into the co-creation ecosystem over time.

In the following section, we provide an overview of the stakeholder ecosystems emerging in each URSOILL Living Lab, based on the mapping of at least 60 stakeholders per territory. This overview highlights the main actor constellations around the experimental sites, shows how different governance levels and societal groups are represented, and points to initial gaps or asymmetries that will be addressed in subsequent engagement cycles (2.1.2). It also offers an emerging understanding of the different types of stakeholders, their perceived importance and influence, and the main barriers and opportunities for their commitment (2.1.3), as identified by the Living Lab implementers.

Finally, we present the conditions that may enable or hinder successful interventions on the sites (2.2), drawing on the first feedback loops collected through a PESTLE format during local co-creation events (CCS#1) in each Living Lab context.

N.b.: For ethical reasons, stakeholders are not identified by name in this report. The stakeholder mapping was carried out by the Living Lab leaders, with support from their Living Lab partners. The categorisation of stakeholders reflects the interpretation and perspective of the Living Lab leaders.

As a result of Phase 2 (See 1.3), the Living Lab leaders together with the support of selected Living Lab participants, produced a mapping of at least 60 stakeholders for each Living Lab. This is conceived as an initial baseline of the stakeholder ecosystems of each LLs. One essential aspect of URSOILL co-creation process will be not only to deepen the engagement with the stakeholders already mapped, but also broaden this list of actors, where relevant. This may include strategically targeting specific stakeholders for future activities (assessment, sustainability, replication or exploitation) that comes later in the project.

Overview

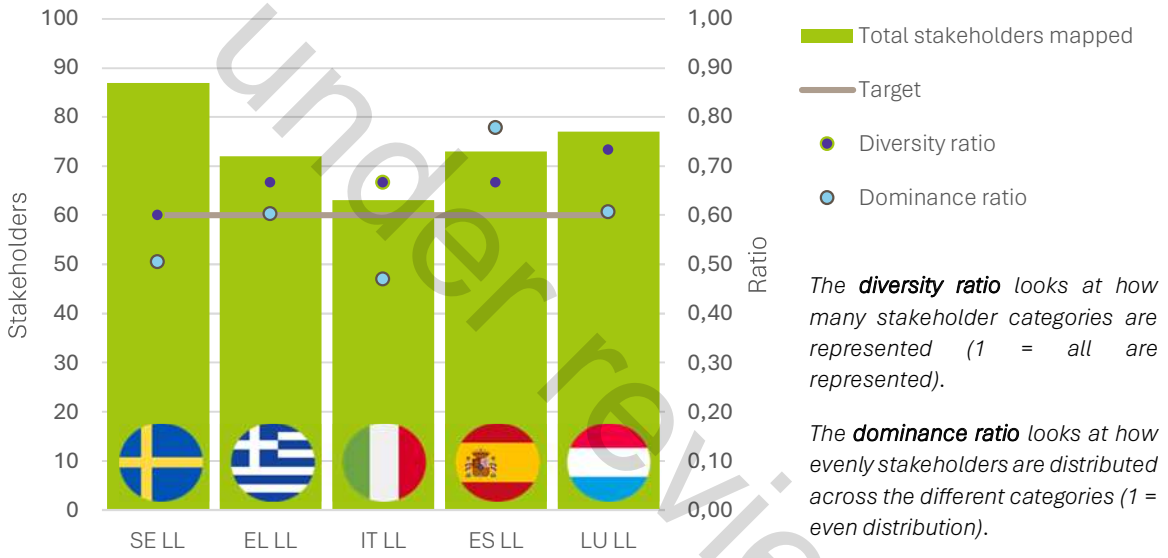

Figure 12 - Total stakeholders mapped per Living Lab

All LLs have reached the minimum target of mapping 60 stakeholders per LL, with above average diversity of stakeholder categories represented (ranging from 60 % diversity for the Swedish LL, to 73 % in the Luxembourg LL). However, there is a potential risk a stakeholder dominance as stakeholders from Public Governance, Business or Research together make up for >50 % of identified stakeholders in all LLs but the Luxembourg LL.

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Stakeholder diversity

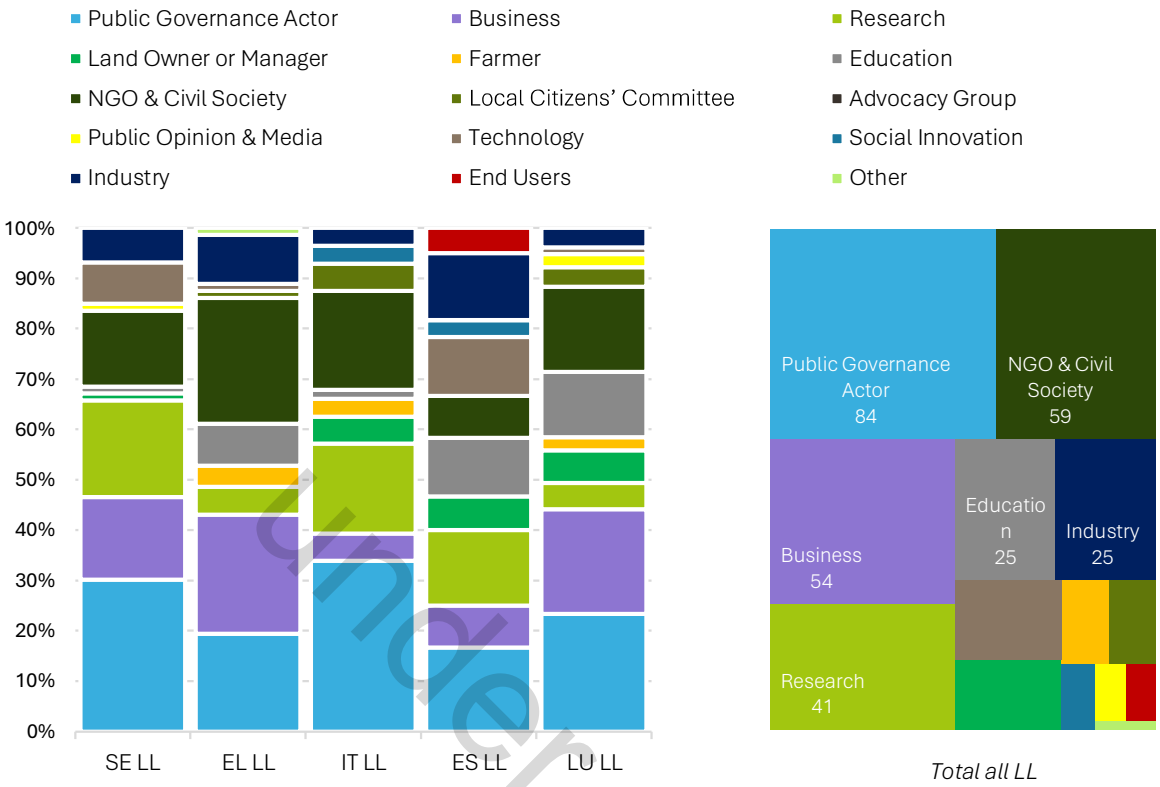

Figure 13 - Stakeholder diversity

- Public actors (Public Governance actors and Local Administration) represent 25% of the mapped stakeholders, the vast majority of whom support the URSOILL objectives (64 out of 84);
- NGOs and civil society actors account for 16 % mapped stakeholders, of which 52 are considered supportive;
- Economic operators (business and industry) represent 23 % of the 348 mapped stakeholders, with 54 identified as supportive.

Overall, 86.5 % of the mapped stakeholders are identified as of relevance for more than 1 experimental sites, meaning their participation and the contribution they can make to the Living Lab co-creation process is well founded.

A clear gap however is the identification of end-users, or "lay-actors"[6] that experience the urban space (residents, school pupils, students, community organisations, etc.) either as producing, benefitting or paying for it. Past LL experiences shows that LL sustainability fails not because of innovation complexities, but simply because of end-users rejections or unexpected behaviours[7].

[6] Following the typology of participants developed by Nabatchi et al. (2017) as cited by Nesti, G. (2018), "Co-production for innovation: the urban living lab experience" in *Policy and Society*, 37(3), 310–325. https://doi.org/10.1080/14494035.2017.1374692 : Lay actors, as opposed to state actors are members of the public who can be involved in co-producing [...] as citizens (the members of a community), clients, or customers. They participate in co-productive activities mainly to take enjoyment from participating and to improve the quality of local services and of their live.

[7] Lakatos, E.S. et al. (2024), "A systematic review of living labs in the context of sustainable development with a focus on bioeconomy" in *Earth*, 5(4), pp. 812–843. https://doi.org/10.3390/earth5040042

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In the urban context, public space is not only scarce but must negotiate conflicting priorities (nature preservation, urban food production, access to nature, infrastructure development, etc). End-users' preference may pursue divergent goals from that of others, better represented stakeholders. Their activation will be a focus of the URSOILL co-creation process.

Position towards URSOILL's objectives

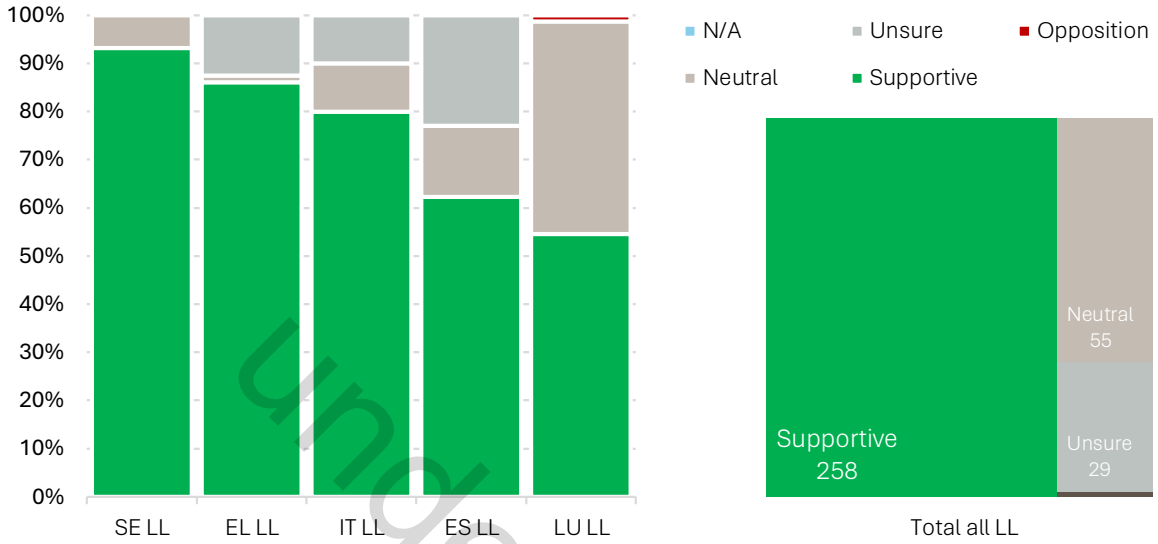

Figure 14 - Stakeholders mapped in relation to the position towards URSOILL

In general, the mapped stakeholders have been predominantly (258) identified as supportive of the main objectives of the project. This may represent either:

- a broad agreement around the objective pursued by the LL;
- a broad agreement around the main objectives of URSOILL (supporting urban soil health);
- or an under-representation of potential Adversaries in the mapping process.

While involving actors that would be fundamentally against the LL process may not be constructive for the LL development, it is still important to understand who they are, and why they may have such position, be it direct opposition, or more nuance concerns, relating for instance to conflicting land-use priorities, different objectives, or a preference to ignore certain soil health considerations. They are also important for the long-term sustainability of the LL: the barriers they may raise must be taken into account. Previous research on urban living labs shows that "diversity of opinions and interests can create obstacles to the process of co-creation and implementing solutions" and it is therefore important "to adopt mediation and facilitation mechanism"[8].

[8] Almeida, F., & Deutsch, N. (2025), "Urban living labs as catalysts for innovation: Advancing urban ecosystems within the quintuple helix model" in *Urban Governance* Volume 5, Issue 2, June 2025, Pages 133-141. https://doi.org/10.1016/j.ugj.2025.05.005

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Role in the HSLL framework

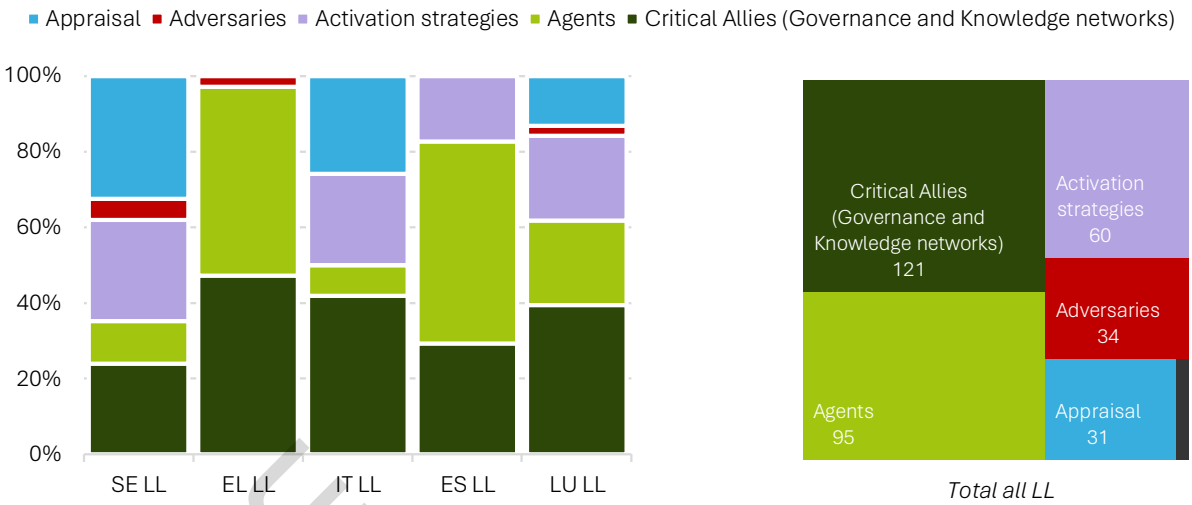

Figure 15 – Distribution of mapped stakeholders against the HSLL categories

All mapped stakeholders were aligned with 5 categories of the HSLL framework (see 1.3):

HSLL Category	Definition
Critical allies	Stakeholders critical for governance, regulation and soil-related knowledge networks
Activation Strategies	Stakeholders that can catalyze engagement, mobilize and facilitate co-creation processes
Agents	The essential actors with direct control over land access, and technical capabilities as well as (non)human influencers
Appraisal	Stakeholders that provide evaluation, monitoring, and financial and regulatory sustainability
Adversaries	Stakeholders who represent potential challenges, blockers or need adaptive approaches due to the degree of affectedness by the issue

Table 3 – Definition of the stakeholder categories in the Healthy Soil Living Lab framework. Author: Farah Makki, Politecnico di Milano

At the onset of the co-creation process, it is natural that LL leaders and the consulted LL participants primarily identified Critical Allies and Agents as they are essential for implementing the solutions (and were already identified at the proposal stage) and for creating an initial "critical mass" to launch the Living Lab process. In the upcoming months of the project, the Living Labs leaders will focus on identifying further actors to expand the outreach where needed and develop related Activation Plans (included in D1.3 due June 2026). These activation plans may specifically focus on actors that can help address bottlenecks to solution implementations at the experimental sites, and on Appraisal actors, especially later on when the time comes for the first co-assessment of progress as part of the co-creation process (planned for around Q2 2027 as part of the CCS#3)

2.1.3. PESTLE Stakeholder mapping per Living Lab

The below section presents 1 data visualisation per Living Lab, mapping their stakeholders across several dimensions: their position in the HSLL logic (see Table 3 for the definitions), their power to influence the living lab process and soil health (on a scale of 0 to 4), level of interest in the urban soil challenge as represented by their size and finally which PESTLE category they belong to. For

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each mapped stakeholder, barriers and opportunities to engagement were also considered by the Living Lab and are summarised here. Finally, some brief orientations regarding possible activation strategies are indicated, based on the baseline.

Stakeholder mapping for the Greece Living Lab

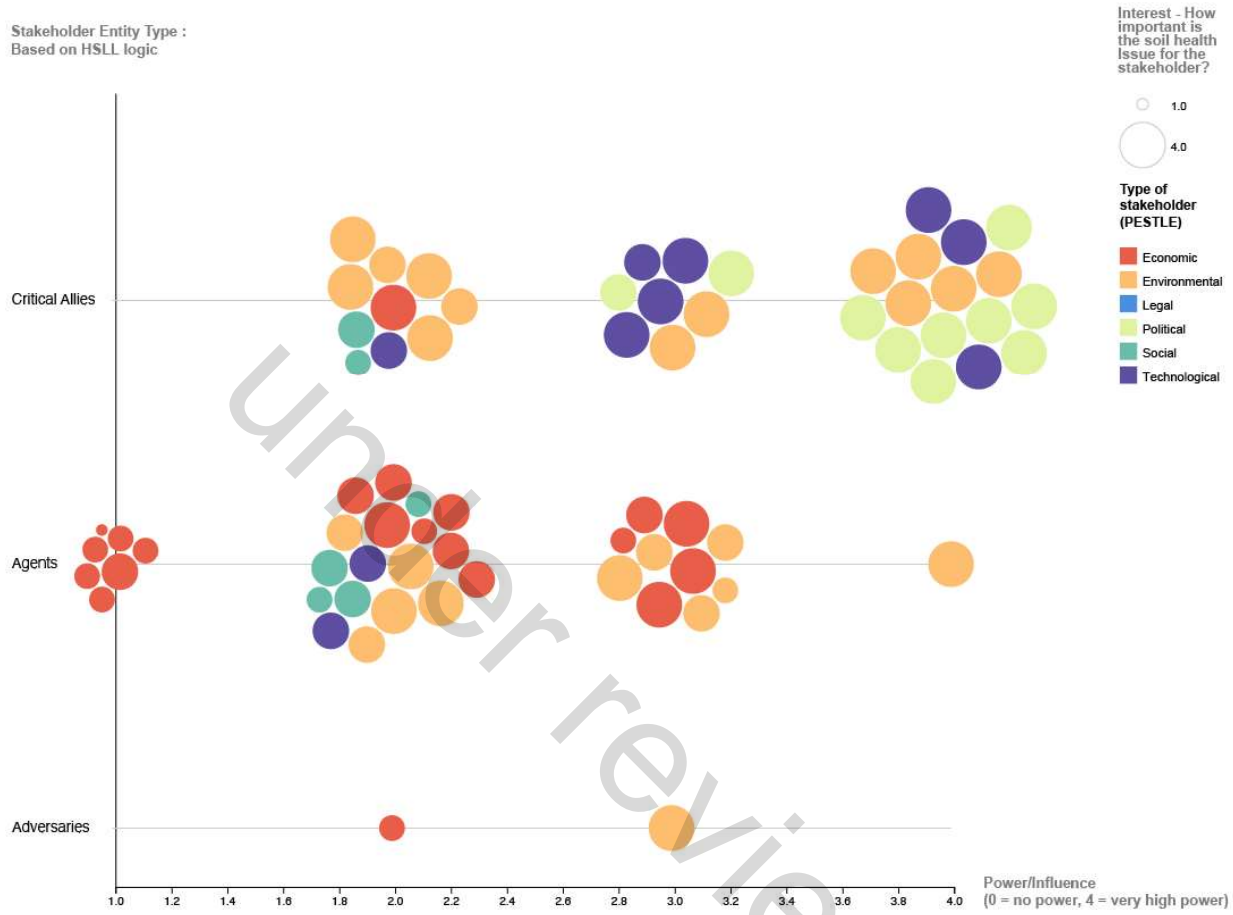

Figure 16 Greece LL: stakeholders Power x Interest x PESTLE distribution integrating the HSLL perspective.

under review

Barriers to engagement identified by the EL LL:

- economic and organisational barrier: limited funding available, lack of time (seasonal availability for forestry sectors) and prioritisation of productive activities over environmental management / protection
- administrative burden: difficult for regional authorities and/or national bodies to actively engage in co-creation process beyond observation
- lack of awareness on the importance of soil health

Opportunities and motivations identified by the EL LL:

- motivated by potential to improve resilience of supply chain (food, material)
- opportunity for visibility (and branding) as participating in a sustainability process
- generation and access to new data on soil health

Possible focus for the LL activation strategy and engagement plan (designed as part of D1.3):

The Greece Living Lab has mapped a critical core of Allies and Agents with a good diversity ratio (0.67)[9] to involve in the first steps of the co-creation process, however:

- future engagement effort could focus on Activation stakeholders, who can promote the activities and potentially mobilise other organisations that are not engaged currently (such as Legal actors)
- additional stakeholder identification and activation may be necessary later in the Living Lab process when reflections begin on the sustainability of the Living Lab approach. This would involve identifying actors who can take forward the results of the assessment / appraisal supporting the uptake / upscale of their site experiments to either new sites or integration into local policies and regulations

Stakeholder mapping for the Italy Living Lab (IT LL)

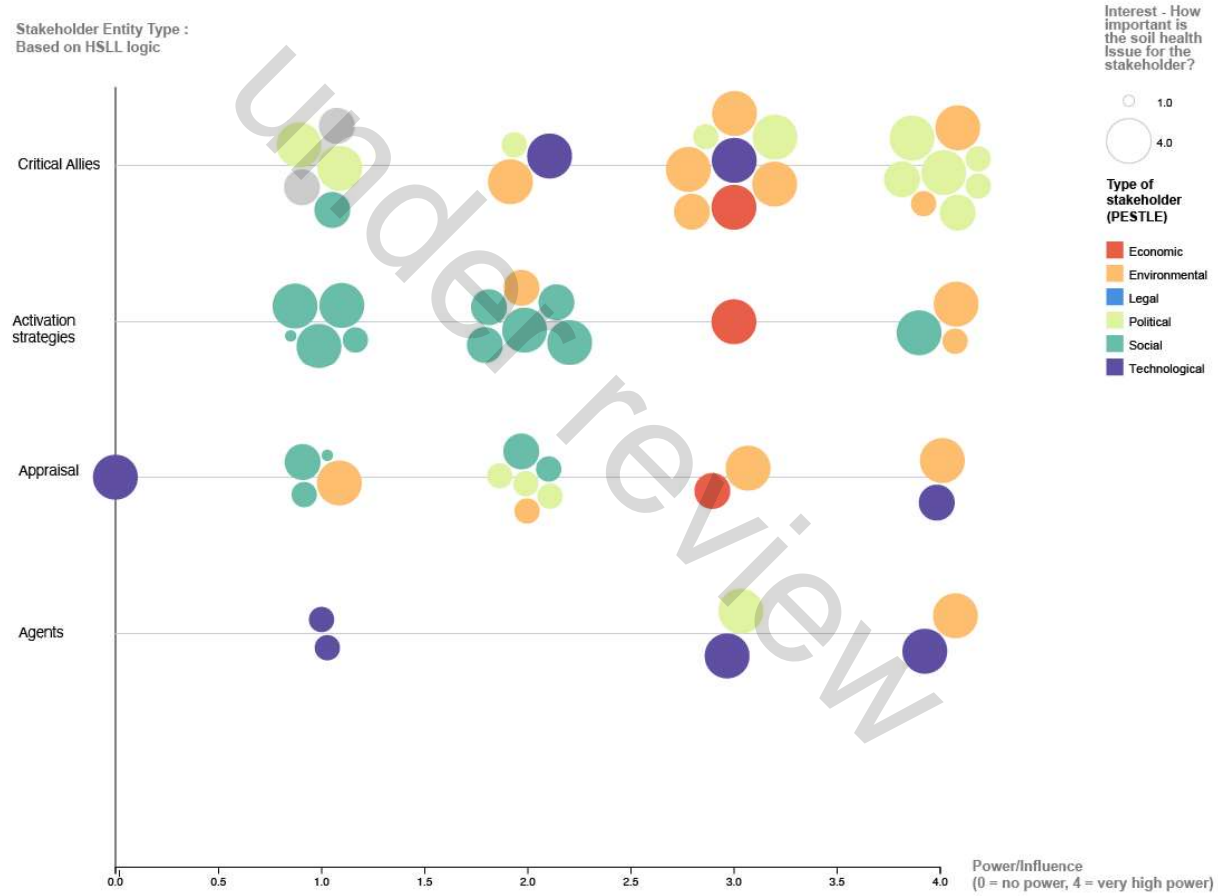

Figure 17 Italy LL: stakeholders Power x Interest x PESTLE distribution integrating the HSLL perspective.

Barriers to engagement identified by the IT LL:

- organisational barrier: time and personal availability limit the ability of stakeholders to commit to a long-term, iterative co-creation process
- Political and/or administrative burden: slow / complex approval processes for interventions might complicate collaborations; changes in political priorities

[9] See Figure 13 - Total stakeholders mapped per Living Lab

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- logistical issues: existing technical barriers (regulatory, availability of material, etc.) may impede the willingness of participants, as feasibility of interventions might appear too complex

Opportunities and motivations by the IT LL:

- desire to advance scientific research on urban soil health
- offer technical training to local actors
- funding opportunity through the cascade funding offered by URSOILL

Possible focus for the Italian LL activation strategy and engagement plan (designed as part of D1.3):

The initial mapping developed by the Italian LL presents a good diversity of actors both in terms of sectors, and HSSL categories; however:

- considering the identifying barriers to engagement, as well as the barriers identified to solutions development and sustainability (see PESTLE analysis in 2.2.2), one focus of the IT LL could be on identifying both Adversaries (and why they can pose a challenge) and Activation stakeholders who could help address some of these identified pitfalls or bottlenecks
- as for all LL, the identification and engagement of end-users will need specific attention

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Stakeholder mapping for the Luxembourg Living Lab (LU LL)

Figure 18 Luxembourg LL: stakeholders Power x Interest x PESTLE distribution integrating the HSLL perspective

under review

Barriers to engagement identified by the LU Living Lab:

- regulatory uncertainties might hinder feasibility
- sustainable soil management is not often a priority topic
- potential conflicts between land users
- data confidentiality
- perceived (un)effectiveness of proposed solutions (such NbS) might influence interest in participating

Opportunities and motivations identified by the LU Living Lab:

- collaboration in an international scientific network
- generation and access to new data on soil health
- replication and scaling potential of experimentation

Possible focus for the LUX LL activation strategy and engagement plan (designed as part of D1.3):

The mapping developed by the LU LL already presents a very high diversity of actors (including end-users) distributed across sectors and categories of the HSLL framework. Out of the five Living

Labs, it is however the one with lowest organisations indicated as supportive of URSOILL objectives (42 indicated as supportive, 34 as neutral, and 1 in opposition). A focus of the activation strategy could be around identifying and engage those stakeholders to ensure they are on-board with the Living Lab objectives.

As for all LL, the identification and engagement of end-users will need specific attention.

Stakeholder mapping for the Spain Living Lab (ES LL)

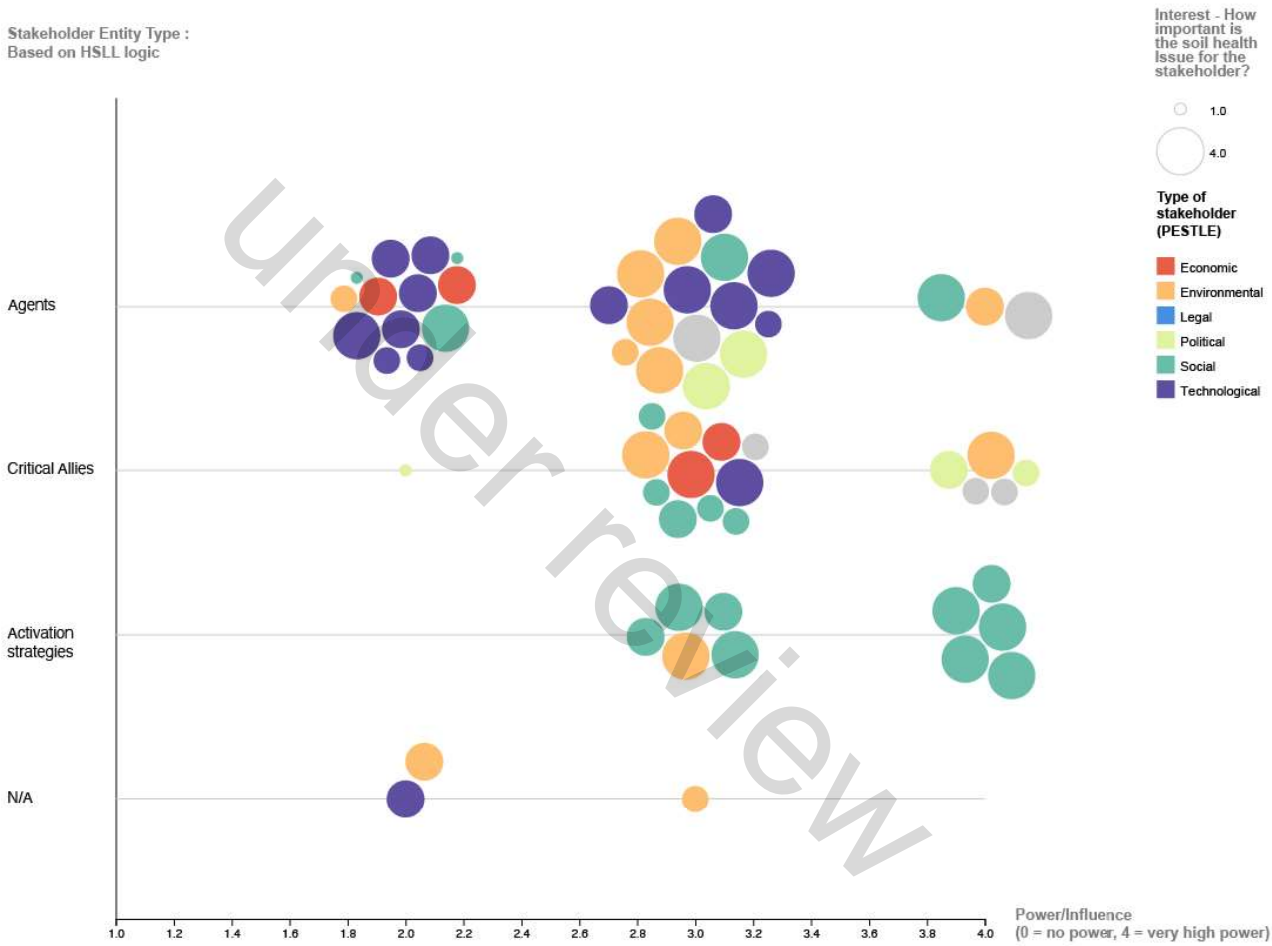

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Figure 19 Spain LL: stakeholders Power x Interest x PESTLE distribution integrating the HSLL perspective

Barriers to engagement identified by the ES Living Lab:

- complex bureaucratic procedures for interventions might limit interest
- rigidity of URSOILL as a Horizon project, which sets a number of conditions and requirements in terms of timeline and activities
- competing policy priorities for institutional actors, and the need to justify their participation
- concern for the private sector over IP arrangements, and the high costs of going beyond minimum compliance when it comes to soil management
- educational organisations have limited means to adapt their curriculum

Opportunities and motivations identified by the ES Living Lab:

- interest in testing new NbS approaches in real sites
- align with regional environmental policy (Basque Soil Strategy)
- technical and financial support offered by the LL
- visibility
- generation and access to new data on soil health
- improvement of local green spaces for community end-users

Initial ideas to develop the ES LL activation strategy:

The baseline mapping presents a high diversity and representation of actors from different sectors; however:

- additional stakeholder identification and activation may be necessary when reflections begin on the sustainability of the Living Lab approach. This would involve identifying actors who can take forward the results of the assessment / appraisal supporting the uptake / upscale of their site experiments to either new sites or integration into local policies and regulations
- considering the identified barriers (bureaucracy, competing political priorities, regulatory hurdles (see PESTLE analysis in 2.2.4) identifying Adversaries (and their motivations) and, conversely, the right activation strategies could help address, or circumvent them
- as for all LL, the identification and engagement of end-users will need specific attention.

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Stakeholder mapping for the Swedish Living Lab (SE LL)

Figure 20 Sweden LL: stakeholders Power x Interest x PESTLE distribution integrating the HSLL perspective

under review

Barriers to engagement identified by the SE LL:

- limited time and economic interest

Opportunities and motivations identified by the SE LL:

- to be further defined as part of the activation strategy for the LL

Initial ideas to develop the SE LL activation strategy:

The stakeholder mapping for the SE LL represents the lowest diversity out of the five, with 3 categories (research, business, and public governance actors) making up > 65 %. This pattern is also reflected in the PESTLE mapping, with a very high representation of Technological actors. To ensure a balanced and inclusive approach to the co-creation process, additional effort will be needed to identify and activate a wider range of actors. This would ensure that discussions and perspectives do not rely predominantly on a technological or expert-driven view of urban soil health, but also consider the specificities of urban spaces (social use, community perspectives, local dynamics, etc.)

2.1.4. Stakeholders Ladders of "Importance", "Influence", "Interest"

This section presents the first "ladders" of importance, influence and interest for the more than 300 stakeholders mapped across the five URSOILL Living Labs. These ladders do not rank actors

in an abstract way; instead, they reflect how Living Lab implementers currently perceive the relevance and engagement potential of each stakeholder in relation to specific experimental sites and soil-health challenges. They offer a working picture of where authority and motivation are concentrated in each local ecosystem, and where targeted outreach or trust-building may be most needed.

The analysis builds on the qualitative and quantitative information collected through the stakeholder profiling sheets. For every actor, partners scored how important their participation is for the Living Lab (0–4), indicated the sites for which they are relevant, and explained why they are considered important, adding site-specific notes where appropriate. They also rated each stakeholder's power or influence over soil-health outcomes (0–4), with short explanations of how they can enable or block change. Finally, they evaluated stakeholders' interest in soil health and their motivation to take part in the Living Lab (0–4), clarifying what aspects of the issue matter to them and who within an organisation is engaged.

Drawing on the qualitative justifications recorded in the profiling sheets, we move from individual scores to a set of recurring "importance", "influence" and "interest" clusters that cut across the five URSOILL territories. These clusters highlight which types of actors are seen as indispensable for implementation, which hold decisive levers over land use, policy and knowledge, and which groups are emerging as key allies for social mobilisation and long-term stewardship.

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Stakeholders Ladder of "Importance"

Importance cluster	Importance score (0–4)	Why they are important (from your descriptions)	Typical sites concerned
Land owners & site managers	3–4	Own/manage land where pilots take place; "issue permits and define technical requirements", "manage urban lands", "authorise works, support community engagement and integrate soil-health actions in municipal planning"; without them "no intervention, pilot or soil-health activity could be implemented"	Often *all sites* within their jurisdiction
Regulators, policy & funding authorities	3–4	Have "regulatory power and specific departmental focus on the environment"; "define policies, priorities and funding that influence soil remediation, land regeneration and sustainable development"; can "shape national soil and agricultural policies" and "scale successful soil-health interventions"	Regional/national territories covering LLs (e.g. Basque region, Western Macedonia; metropolitan or national scope rather than a single site)
Scientific & technical knowledge providers	3–4	Provide "scientific expertise, research capacity, laboratory support", "advanced research capabilities in sustainability and environmental science", "soil analysis tools and sensors", "biochar and other soil-improver technologies"; ensure evidence-based design, monitoring and evaluation and help develop methods, indicators and protocols	Relevant to *all pilot sites* where methods are applied; sometimes highlighted for specific innovation tests (e.g. biochar sites, monitoring-intensive plots)
Producers & value-chain actors dependent on soil	2–4	Their business "depends on healthy soils, good raw-material quality and stable supply chains"; "soil health strongly affects yields, quality, safety and marketability of their products"; they "manage or influence forest soils, slopes and natural landscapes" or "agricultural land and water resources"	Agricultural, forest and MAP production areas; sometimes peri-urban or regional hinterlands linked to LL cities
Community, education & advocacy actors	2–4	Schools, NGOs, cultural institutions and associations that "engage students and families", "facilitate citizen participation", "support behavioural change and awareness", provide "storytelling and dissemination", and "strengthen social cohesion and local identity" around soil-health projects	Urban LL sites where citizen engagement is central (e.g. all Turin sites, neighbourhood gardens, community forests and parks)
Industrial, infrastructure & technology implementers	2–3	Industrial and utility actors "control major industrial lands that strongly affect soil conditions", "manage underground networks that affect excavation, planting and soil interventions", or implement "renewable energy, waste management and infrastructure projects" with direct land-use and contamination implications; importance often justified by both risk (negative impact) and opportunity (transition to more soil-friendly practices)	Specific sites where their assets or projects are located (industrial areas, energy or water infrastructure corridors, Mirafiori Sud, etc.)
Transition, circularity & replication enablers	3–4	Stakeholders who "can experiment, replicate and disseminate results", provide "expertise in scalability, exploitation and dissemination", or "support circular strategies that reduce soil pressure, promote resource efficiency and enhance sustainability"; they connect LL pilots to broader transition agendas and markets	Innovation-focused sites (e.g. biochar trials, circular biomass value chains) and cross-site scaling work across cities or regions
End-users and local communities	2–4	Urban farmers, residents, school communities and other end-users whose practices and acceptance determine whether soil-health interventions persist; their dependence on healthy soils for livelihoods, food quality and safety makes their participation important even where formal power is low.	Neighbourhood gardens, urban farms, schoolyards, community forests and parks where soil-based activities are accessible to residents, families and local groups; often coincide with demonstration sites designed for education, co-creation and long-term stewardship.

Source: Processed qualitative data provided by the five Living Lab leaders in the stakeholder profiling sheets; analysis and elaboration by Farah Makki, Politecnico di Milano, DAStU.

Figure 21 Stakeholders Ladder of "Importance".

The importance ladder shows, for example, how landowners and site managers, regulators and funding authorities, scientific and technical providers, producers and value-chain actors, community and education organisations, industrial and infrastructure operators, transition and circularity enablers, and end-users or local communities are typically rated from moderately to very important, albeit for different reasons and at different sites.

Likewise, the influence ladder distinguishes between regulatory and land-use authorities, strategic policy and funding bodies, scientific and methodological leaders, operational

implementers and replicators, market and value-chain shapers, civic and socio-cultural influencers, knowledge brokers, and actors with low or peripheral influence who may nonetheless become critical niche allies.

Stakeholders "Power/Influence" Ladder

Influence cluster	Power score (0–4)	What this influence looks like in your data	Why it matters for soil health in the LLs
Regulatory & land-use authority	3–4	Ministries, regional authorities, municipalities, biosphere/heritage managers with "direct control over land use", "authority over municipal land, public works and environmental interventions", "strong regulatory authority over agriculture, soil management, subsidies, environmental rules", "governing body responsible for managing this protected area"	These actors can formally approve, restrict, or redesign land-use and green-space interventions, set binding rules, and enforce conservation or remediation measures that directly determine soil conditions and LL implementation space.
Strategic policy & funding power	3–4	National/EU bodies and regional agencies whose "position enables them to influence both public and private sector actions through enforcing standards or financing", have "political influence to dedicate resources to this topic", or "provide funding, mobilize resources, and support partnerships"	They shape the enabling environment (strategies, programmes, budgets), define priorities and eligibility rules, and can mainstream LL practices into broader transition, CAP, or restoration frameworks or, conversely, deprioritise them.
Scientific, technical & methodological authority	3–4	Research institutes and technical agencies with "strong scientific authority, technical credibility and advisory role", "develop methodologies for monitoring soil health", "cutting-edge knowledge, data and technologies", or "strong influence through research excellence, innovation networks and applied R&D"	These actors determine how soil is diagnosed and valued: indicators, models, monitoring methods, and recommended practices that guide LL design, evaluation, scaling, and evidence for policy change.
Operational / implementation & replication power	2–4	Energy, water, engineering, waste, forestry and implementation partners that "implement major transition projects", "manage green-space, landscaping and forestry components", "program implementation", "can experiment, replicate and disseminate results", or are "future site manager and replication power"	Their projects physically alter land, water flows and vegetation; they host pilots, integrate LL solutions into infrastructure, scale them to other sites, and can also generate negative impacts if soil is not prioritised.
Market & value-chain influence	1–3	Buyers, cooperatives and companies that "influence local biomass sourcing and waste-wood flows", "have influence on value-chain standards and sourcing", "can influence local agricultural practices, mobilise farmers and support adoption of improved soil techniques", or provide "solutions to the market"	They embed soil-health requirements into contracts, quality standards or product narratives, steering producers toward or away from sustainable soil practices and making LL outputs economically viable.
Advocacy, civic & socio-cultural influence	1–3	NGOs, schools, culture actors and communities that "raise public awareness", "translate technical messages into accessible stories", "have high influence through strong relationship with citizens", "facilitate citizen participation", "host project events", and shape "public understanding and action"	They mobilise constituencies, legitimise interventions, co-create narratives around soil, and can pressure decision-makers; they rarely control land but influence social license and everyday practices that support or resist LL changes.
Knowledge brokerage & governance bridging	2–3	Foundations, food-policy actors and intermediaries that "integrate knowledge in local governance", "key knowledge and governance actor on the food system", "facilitate research collaborations and connections between academic, government, and industry stakeholders"	They translate between sectors, aggregate data and experience, and help align LL experiments with local policies, planning regulations and community needs, making multi-actor coordination on soil feasible.
Low / peripheral influence	0–2	Actors described as having "limited influence", "soil health not core to their business", "no regulatory authority", or only small-scale/operational roles	These stakeholders are not decisive for soil outcomes alone but can become important allies (e.g. demonstration sites, niche innovations, local supporters) or sources of resistance if neglected.

Source: Processed qualitative data provided by the five Living Lab leaders in the stakeholder profiling sheets; analysis and elaboration by Farah Makki, Politecnico di Milano, DASTU.

Figure 22 Stakeholders Ladder of "Power/Influence".

A first cross-Living-Lab reading of barriers and opportunities begins to reveal shared patterns behind these scores. Four broad clusters emerge: time and resource constraints, institutional and governance hurdles, thematic and strategic (mis)alignments, and issues of relations, visibility, knowledge and data. For each cluster, stakeholder inputs point simultaneously to what holds actors back (for example limited staff capacity, administrative burden, weak soil mandates, fragmented networks, or lack of data) and to what could motivate deeper engagement (such as dedicated funding, integration into plans, recognition as innovation sites, co-produced communication, or access to new evidence and tools).

under review

Stakeholders Ladder of "Interest"

Cluster	Type	Barriers (what can hold them back)	Opportunities (what can motivate them)
Time & resources	Organisational / Economic	Limited staff time and human resources.	Dedicated funding and co-funding for pilots.
		Heavy workloads, seasonal peaks, complex coordination.	Capacity-building and training for staff, teachers and volunteers.
		Limited funding and dependence on project/EU cycles.	Student, PhD and citizen-science involvement that fits schedules.
		Volunteer-based or informal groups with low operational capacity.	Logistical support for events, workshops and material transport.
		Logistics barriers (travel to sites, moving materials such as biochar).	Support for sustainable local value chains and regional development.
Institutions & governance	Political / Organisational	Bureaucracy and heavy administrative workload.	Alignment with climate, green-space and sustainability plans.
		Political/administrative complexity and multi-municipality	Integration of LL pilots into city and park management plans.
		Slow approval processes, legal and safety requirements.	Access to policy-relevant soil and biodiversity data for planning.
		Shifting priorities and rigid planning/budget cycles.	Recognition as European pilot or innovation sites.
		Need for clear agreements and collaboration frameworks.	Easier access to EU and regional funding linked to missions.
Thematic & strategic agenda fit	Strategic / Sectoral	Soil health is not a core mandate for some actors.	Framing soil as key to climate adaptation and green-space quality.
		Competing agendas and low focus on urban soils.	Showing benefits for yields, raw-material quality and ecosystem services.
		Misalignment with academic calendars or operational cycles.	Using LLs as testbeds for NBS, circular bioeconomy and resilience pilots.
		Need to adapt rural or technical protocols to urban regulations.	Co-creation that responds to resident needs and reduces conflicts.
Relations & visibility	Social / Strategic	Limited local presence or fragmented networks.	Joint workshops, community experiments and citizen-science.
		Informal structures and unclear coordination roles.	Stronger networks among municipalities, parks, NGOs, schools and
		Low familiarity with research and soil topics.	Public recognition within LLs, parks and EU missions.
		Limited recognition of grassroots work.	Co-produced communication and locally tailored stories on soil.
			Reputational and networking benefits for organisations and firms.
Knowledge & data	Technical / Knowledge	Lack of site-specific soil and biodiversity data (especially urban).	Access to LL datasets, new soil/biodiversity data and monitoring tools.
		Limited technical skills on soil among officials, educators and	Training and technical support on soil assessment, composting and
		Technical and regulatory complexity of some solutions (biochar,	Applied research and publication opportunities for universities and labs.
		Low incentives for actors not directly responsible for soil.	Evidence to support policies, communication and education.
			Urban demonstration sites that can be replicated elsewhere.

Source: Processed qualitative data provided by the five Living Lab leaders in the stakeholder profiling sheets; analysis and elaboration by Farah Makki, Politecnico di Milano, DASTU.

Figure 23 Stakeholders Ladder of "Interest" intended as perceived barriers and opportunities for their engagement in the URSOILL LLs.

Taken together, the ladders and clusters provide a shared reference for prioritising engagement strategies, designing tailored outreach for high-impact but hard-to-reach actors, and recognising early allies who can help catalyse broader co-creation dynamics, while aligning Living Lab activities with the conditions that matter most to their stakeholders.

2.2. Barriers & Opportunities for urban soil health – PESTLE

As part of their first URSOILL Co-Creation Session (CCS#1) organised in February 2026, each LL was asked to prepare and discuss a PESTLE analysis (see Figure 7 for guiding template) to map barriers and challenges to urban soil health and the engagement of key stakeholders in the URSOILL process.

The depth and level of detail of the analyses can vary depending on the priorities of each session, the available time, and the participants who were present. Indeed, not all LL followed exactly the same agenda: some co-creation sessions focused more on site discussions, others concentrated on shared challenges, and the representation of stakeholders also differed between meetings. As a result, the PESTLE outputs from the CCS#1 had varying degrees of scopes and depths; LL leaders were therefore invited to further refine and complement the analysis.

Summary of the discussions that occurred were also prepared by the Living Lab Leaders, which will be included in D1.3.

Under review

2.2.1. Greece Living Lab - PESTLE Analysis results (CCS#1)

POLITICAL	ECONOMIC	SOCIAL
• Limited prioritization of soil and green infrastructure in the political agenda • Environmental policies vulnerable to political changes • Existing land-use regulation and agrochemical control mechanisms establish clear rules for land use and agrochemical control, supporting soil protection objectives • Opportunity for collaboration with universities and agronomists	• Grants for environmental and urban projects are available (notably through EU funding - ERDF or JTF), including funding opportunities for urban gardens • High maintenance costs of green infrastructure • Labour-intensive cultivation management requirements	• Potential creation of local employment opportunities (urban gardening, soil monitoring, maintenance of green infrastructure) • Mobilization of volunteers and cultural associations to actively support urban garden initiatives, soil restoration pilots or public awareness activities as part of the Living Lab • Low public awareness and engagement risks • Risk of limited long-term citizen participation

TECHNOLOGICAL	LEGAL	ENVIRONMENTAL
• Digital tools for soil monitoring and data collection • Opportunity to utilize partners' equipment and expertise • Lack of municipal technological infrastructure • High cost of advanced equipment and automation systems for instance for urban soil monitoring, automated irrigation systems, and smart green infrastructure management	• Legal requirement for minimum green space per capita could be a positive measure – but does exist yet • Bureaucratic licensing procedures for projects in urban areas can involve multiple authorities and lead to delays • Land-use and ownership constraints for intervention sites that are privately owned (with ownership fragmented among multiple owners, or already designated for other land uses in urban plans), limiting the possibility of implementing soil restoration or greening action	• Soil remediation and restoration potential through greening interventions nature-based solutions • Risk of contamination (heavy metals, pollutants) and environmental degradation, with potential public health issues, especially in areas used for recreation or urban cultivation • Urban expansion and soil sealing pressures • Irrigation water quality concerns

under review

2.2.2. Italy Living Lab - PESTLE Analysis results (CCS#1)

The Italian Living Lab leader (InnovHub) with the support of Poliedra and POLIMI developed a detailed PESTLE analysis thanks to very high participation in its CCS#1. To simplify readability, they colour-coded the content depending on the challenges discussed:

Colour code	Cross-cutting	Depaving	Urban agriculture	Forestation	Urban gardens

POLITICAL	ECONOMIC	SOCIAL
• Challenge: Who is responsible for the management and maintenance of forested areas? • Need: Strategic vision and policy planning at local level to ensure sustainability of actions / Upstream community engagement in the decision-making process (pre-design phase) / Integration of ecosystem-based criteria into municipal afforestation plans (e.g., shifting from quantitative tree-planting targets to qualitative, functional soil-plant systems) • Need: Strategic resource/fund allocation by local authorities • Aim / expected achievement: Development of local regulatory frameworks (e.g. Urban gardens policy in Turin)	• Challenge: Who is responsible for the management and maintenance of forested areas? • Risk: Topsoil supply costs • Challenge: Remediation/decontamination costs • Opportunity: Benchmarking of restoration costs (€/sqm) against external funded projects (e.g., STC-Fondazione Cariplo) • Need: Direct award of management contracts (e.g., direct assignment of urban garden maintenance to local associations) • Opportunity: Possibility to seed / facilitate growth of companies and start-up proposing solutions • Opportunity: Sprouting of commercial activities linked to the fruition of the sites • Opportunity: Potential to foster the growth of companies and start-ups providing soil solutions	• Challenge: Limited awareness and understanding of soil health • Need: To improve soil literacy (e.g. From schools to families, non-conventional and experiential education, building local networks, citizen engagement, involving high schools in analytical surveys, civic education on soil quality, fostering long-term sensitivity, shifting the narrative and communication styles) • Aim: Involvement of high schools in analytical initiatives • Challenge: Challenging access logistics / Site usage and public accessibility • Expected achievement: End-users expect the (re)opening of the sites

POLITICAL	ECONOMIC	SOCIAL
• Aim / expected achievement: Implementation of municipal management policies (e.g., guidelines for urban allotment plots in Turin) • Need: Institutional dialogue with Local Health Authorities (e.g. ATS & ASL) / Preventive institutional alignment with Environmental Protection Agencies (e.g., ARPA, Città Metropolitana) to ensure methodological compliance • Need: Institutional alignment on regulatory interpretation • Need: Management of land-use conflicts bottom-up (e.g., balancing environmental desealing goals with the social demand for residential parking) • Opportunity: Inter-municipal policy transfer (e.g., adopting regulatory incentives for de-paving as a compensatory measure for soil sealing, inspired by the Piacenza PUG model (General Urban Plan) • Opportunity: Promotion of a URSOILL 'common position' to influence national transposition • Upscaling strategies from experimental study sites to strategic metropolitan impacts • Challenge: Role of District Administrations in site assignment and social mediation • Challenge: Managing public expectations and safety narratives (e.g., establishing clear and transparent guidelines on what activities are safe or restricted in potentially contaminated areas while waiting for definitive analytical results) • Challenge: Institutionalizing project-based data into formal administrative workflows (e.g., overcoming the rigidity of standard bureaucratic procedures to allow municipalities to officially utilize the wealth of scientific data generated by experimental projects) • Positioning local successful experimentations as European 'Lighthouses' (e.g., promoting exemplary governance and management models for EU-wide replication and policy inspiration) • Fostering EU-level policy exchange on soil remediation (e.g., leveraging the consortium's diversity to map different national regulations and define common EU best practices) • Strategic assignment of communication roles (e.g., mapping and empowering specific trusted stakeholders, such as local NGOs or community leaders, to mediate sensitive technical information to the public)	• Challenge: Valorisation of waste (e.g. orchard waste) • Aim: Development of a digital platform to match soil solution needs with private sponsors and investors • Challenge: Financing models for 'invisible' pre-conditions (e.g., preliminary analytical surveys and soil characterization) • Challenge: Cost pressures from waste management protocols (e.g., high expenses for off-site soil disposal and the procurement of certified "clean fill") • Challenge: High financial and temporal burdens associated with extensive preliminary soil sampling, required to mitigate the uncertainties of unknown past land uses • Opportunity: Associated economic opportunity linked to the valorisation of urban biomass: the creation of small-scale micro-economic and educational supply chains focused on circularity. • Opportunity: Validation of innovative and self-sustaining business models for urban agriculture (e.g., leveraging the successful 'Cascinet' management model to ensure long-term economic viability) • Aim / expected achievement: To develop micro-economies around afforestation and agroforestry, supported by viable revenue streams and business models. • Need: To identify and map local micro-economic value chains and their associated resources and assets. • Aim / expected achievement: To avoid generating additional costs for local governments and public administrations. • Aim / expected achievement: To establish a platform for the scalability of results.	• Aim: Community engagement and usage metrics (e.g., increased public footfall in sites and neighboring areas, growth in the number of active urban gardeners) • Opportunity: Monitoring resident satisfaction and social wellbeing linked to new de-paved land uses • Opportunity. Impact assessment of educational programs (e.g., measuring knowledge gain in students and their families to evaluate soil literacy success) • Opportunity: Delegation of community guidance and social transition processes to established local associations • Challenge: How to best communicate on soil health with citizens? • Challenge: Who does take care of forested areas? • Opportunity from the valorisation of urban biomass: It could engage citizens in educational activities aimed at raising awareness, building capacity, and providing training for new green jobs. • Risk: How to involve citizens in the HSLL? Risk of generating expectation. Challenges in environmental risk communication (e.g., the difficulty of actively engaging citizens when there is still uncertainty regarding soil contamination levels and the permitted uses of public spaces). • Need: The involvement of a strong communication partner to effectively engage stakeholders in the soil health challenge and reach citizens. • Need: Implementation of structured social monitoring frameworks (e.g., assessing the societal impact of soil restoration through qualitative indicators, continuous neighbourhood outreach, and citizen science initiatives). • Aim: To develop a citizen engagement and communication strategy, supported by a toolkit applicable across multiple experimentation sites. • Aim: To evaluate agroforestry practices in urban contexts (which productions are sustainable) and compare them with conventional afforestation approaches. • Aim / expected achievement: Through afforestation, reconnecting people with nature. • Aim / Expected achievement: To improve soil health in order to protect and promote children's health, following a One Health approach. • Need: To acknowledge soil as a collective asset and a core component of environmental citizenship. • Opportunity: looking for synergies on experimental sites of other EU projects iCOSHELL and NEMESIS.

TECHNOLOGICAL	LEGAL	ENVIRONMENTAL
• Challenge / Opportunity: Backfill materials – Leaching tests (for groundwater protection) • Aim / expected achievement: Clear definition of detection limits and analytical data consistency • Challenge: Low correlation between soil and crop analysis → shift towards product-based quality assessment (e.g., historical lack of correlation between soil values and final crop results) • Need: Technical requirements for subsoil monitoring • Opportunity: Utilization of the Milan Desealing Web-Map for site prioritization based on social and heat-island criteria • Challenge: Challenging access logistics	• Aim: Identification of the prevailing legislative framework / Submission of a formal legal inquiry to the Ministry of Environment (MASE) to clarify conflicting decrees post-characterization • Development of local regulatory frameworks (e.g. Urban gardens policy in Turin) • Challenge: Management of land-use change • Need: Simplified procurement frameworks • Risk: Ongoing decontamination procedures/monitoring / Administrative procedures for the formal closure of 'potential contamination' notifications based on favourable analytical results • Opportunity: Regulatory usability levels (to be included in the urban development plan)	• Risk: Topsoil variability within the same lot • Challenge: Lack of historical baseline data • Challenge: Different surface management / maintenance • Risk: Possible contamination / Metals – Lead – PAHs • Expected achievement: Implementation of composite health indices (physical, chemical, and microbiological) for soil recovery • Opportunity : Anthropogenic background • Challenge: Surface water network interactions • Aim: Subsoil management (considering the entire soil profile, not just the topsoil) • Challenge: Impact of previous land management and maintenance

under review

TECHNOLOGICAL	LEGAL	ENVIRONMENTAL
• Opportunity: Use of Technosoils and amendments (biochar, compost, inoculation) for on-site soil creation and circularity • Need: Improving analytical precision: establishing inter-laboratory proficiency testing to harmonise results • Opportunity: Product-based safety and quality validation (e.g., ensuring edibility and high analytical quality of crops as a proxy for soil health) • Opportunity: Biomonitoring through spontaneous flora (e.g., identifying specific spontaneous plants as reliable bio-indicators of soil status) / Experimentation with pioneer species and successional vegetation to colonize newly de-paved soils • Expected achievement: Creation of a local network of specialized providers for nature-based soil solutions • Opportunity: Development of specific 'Land Capability' indices for urban soils through institutional research partnerships • Risk: Looking for soil reclamation techniques that do not fell trees • Risk: Bio- and phytoremediation require a long time to reclaim the soil. Opportunity cost of urban land lock-in (e.g., the long-term unavailability of public spaces undergoing slow nature-based remediation). • Opportunity: A bioremediation experiment is currently underway in GOCCIA, Bovisa (Milan), and could provide valuable insights • Opportunity: Implementing technologies for the valorisation of urban biomass to promote circularity (reuse-based products), such as mechanical collection (vacuuming) and shredding of leaf litter • Opportunity: Tiny forests represent a promising yet largely overlooked model for urban greening.	• Risk: : Regulatory constraints on the use of excavated materials • Need: Alignment with Food Safety regulations • Risk: Concept of "detection limit" • Need: Transition from strict threshold exceedance to site-specific risk assessment criteria • Need: Integrating health and safety standards (involving Local Health Authorities/ATS) • Risk: Regulatory constraints on the reuse of excavated soil (e.g., complex procedures to certify excavated materials for on-site repurposing) • Aim / expected achievement: Synchronization with the EU Soil Monitoring Law transposition • Opportunity: Introduction of 'Anthropogenic Background' levels as a regulatory standard for urban areas • Aim: Addressing the regulatory gap between standards designed for homogeneous agriculture and the mixed-crop reality of urban gardens • Challenge: Regulatory rigidity of phytoremediation protocols (e.g., strict compliance rules and extended timeframes that prevent alternative land uses during the long decontamination phase) • Challenge: Lacking data baseline: Knowledge of urban soil health and structure is limited compared to agricultural soils. A systemic assessment of urban soils is complex, time-consuming, and costly, and is therefore often neglected in afforestation projects. • Challenge: Cross-project data integration and knowledge retention (e.g., capitalizing on indicators and environmental data collected from previous initiatives to avoid duplicating efforts and starting from scratch in new projects) • Challenge: Lacking data baseline: Historical data on urban soil use are frequently unavailable, despite being essential for understanding current soil conditions. This leads to unpredictable subsoil conditions and hidden contaminations. • Aim / expected achievement: To strengthen the collection and integration of epidemiological data. • Challenge: How to connect soil health indicators collected by URSOILL to legal procedures? • Opportunity: The Italian Ministerial Decree 46/19 regulating soil remediation procedures represents an innovative regulatory framework, despite the limited implementation experience to date. It could be considered a best practice for the URSOILL consortium and potentially replicated or adapted in other national contexts. A Cross-national benchmarking of soil remediation frameworks would be very welcome.	• Challenge: Impact of atmospheric deposition on urban soil quality • Opportunity: Deep-soil health assessment • Opportunity: Nature-Based Solutions (NbS) / Using plants as a solution • Opportunity: Systemic approach to site accessibility (e.g., extending soil restoration and public access strategies beyond the specific pilot sites to include surrounding buffer zones) • Risk: Forest planting is often not designed according to an ecosystem-based approach. • Challenge: water management for irrigation; in some cases drinking water is used for agro-forestry, and this should be avoided. • Need / Proposal: To develop a forestation plan that takes into account the soil–tree relationship according to a functional biodiversity approach and functional ecosystem design in urban afforestation (e.g., integrating plant-soil dynamics and biogeochemical cycles rather than focusing solely on tree planting) • Need / Proposal: To incorporate a pollinator monitoring study into the forestation plan, conducted before and after the interventions and over the long term. • Associated Environmental Risk to the valorisation of urban biomass: The extraction and reuse of urban biomass may deplete the natural litter layer, as residual biomass is a fundamental component of soil naturalness and plays a key role in maintaining organic matter, nutrient cycling, and ecological functions. • Associated environmental benefit from the valorisation of urban biomass: it can reduce the time leaves remain on the ground, thereby limiting dust and pollutant dispersion, while enabling the on-site reuse of biomass as fertiliser and soil mulch. • Risk: Agricultural products may become contaminated when grown in unhealthy or polluted soils. • Need: To identify which types of production are compatible with polluted soils (e.g., ornamental flowers).

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2.2.3. Luxembourg Living Lab - PESTLE Analysis results (CCS#1)

POLITICAL	ECONOMIC	SOCIAL
• Political orientation can have an influence on the way land soil and green spaces are managed and have an impact on promoting good practices (Klimapakt). • European legislation: Farm to Fork / new soil directive. • Increase of public awareness could impact political will. • Political will to control / limit source of pollution. • An opportunity from political factors is the application of soil directive (from 12/2025) even if there is a lack of awareness on soil from the political.	• Economic opportunities could influence soil and land use with the creation of new businesses and/or new services. • Lack of healthy lands in the future could impact economy. • Economic pressures on sealing, might be higher costs for maintenance for unsealed surfaces. • Need to find the right balance between need for sealing (economic project) and soil protection. • An economic pressure might be the absence in the cities for soil ownership. • Penalties for owners.	• Raise public awareness on the urban soil subject (information on soil pollution levels). • Healthier will from the public but they do not want to change their habits • Feeling of not having power to change things. • Perception of unsealed soil, mostly perceived has dirty, badly maintained needs a change in habits, communication on unsealing, seems to be easier to continue the way we always did. • Reinforce linkages between all different citizens. • Soil society in Luxembourg might help to increase awareness on soil health.

TECHNOLOGICAL	LEGAL	ENVIRONMENTAL
• Measurement by monitoring tools to measure organic compounds. • Tool = soil reconstruction/soil amendments. • Time frame of projects works against application of NbS. • Technical development due to innovation depollution techniques. • Availability and cost. • Technological tools might be complicated regarding electrical grid. • Use of porous material inefficient on some soils that are naturally not porous/draining such as clay. • Lack of data share, social media great tools for literacy.	• Laws might restrict action by their complexity. • Use of risk assessment can improve evaluation instead of black or white thinking. • Legal (un)certainty, new soil directive. • Transposition of soil directive. • Laws that might permits enable or restrict action: Transferable Development Rights (TDR). • PAG define limits of maximal constructed area, avoid excessive soil sealing. • Climate change adaptation strategy. • Insufficiency on soil protection. • Green space protection in urban planning.	• Climate change is an environmental condition that might shape risk on soil pollution. • Constant increase of diversity of pollutant can increase complexity on environmental evaluation. • Soil remediation can lead to healthier environment but can also destroy habitats (e.g. dig and dump). • Pollution transfers via flooding, sludges, rainwater. • Weather, ecological analysis in the wider context, restoration strategies, choices for types of ecosystems. • Desealing might increase soil pollution risk, assessment of soil pollution before desealing. • Flood regulation to adapt to climate change, sponge city concept. • Climate extreme flooding, education form disaster, climate scepticism.

under review

2.2.4. Spain Living Lab - PESTLE Analysis results (CCS#1)

POLITICAL	ECONOMIC	SOCIAL
• Administrative fragmentation challenges due to different responsibilities in administration in a same site (green space, roads, etc) • Coordination between different actors • Strategic policy alignment on circular economy and urban restoration offer a favourable framework for interventions • Difficulties in continuing initiatives • Define an end-use objective for an intervention/site	• Waste disposal from removing the paving is costly. Possibility of reducing costs by making on-site waste part of the solution • Circular economy model, reusing waste and reclaimed land • Pressure of industrial growth • Opportunity to finance actions through the project and cascade funding	• More outdoor time and meaningful real experiences in natural environments for children. • Invisibility of soil as living system creating difficulty in generating awareness. • Lack of time or lack of continuity among those involved in a site (teachers mainly). • Educational and recreational spaces for citizens.

TECHNOLOGICAL	LEGAL	ENVIRONMENTAL
• Extend decompaction and possibility of using inoculants in the soi lfor remediation. • Incorporate soil microbiology. • Potential use of biomaterials and alternative technologies for monitoring. • Soil with agro-ecological value, use of citizen science measurement kits.	• Compliance with regulations on the declaration of contaminated land and upcoming soil monitoring law. • Compliance with the established use of land for each site. • The definition of 'playground' according to the Basque Government's Department of Education does not include the aspect of integrating nature. • Waste management guidelines are strict and do not facilitate the reuse of materials on site. • Difficulties to include soils in school curriculum.	• Climate risks are similar in the municipalities: heat waves and fire risk. • Invasive species control and biodiversity restoration. • Difficulty raising awareness about the importance of soil health. • Environmental monitoring and tracking. • Ecological connectivity to other green spaces. • Planting of native species and natural grassland. • Soil sealing.

2.2.5. Sweden Living Lab - PESTLE Analysis results (CCS#1)

POLITICAL	ECONOMIC	SOCIAL
Barriers • Huge need for housing which affects the land take • Swedish National heritage board (ancient monuments can be limiting the actions) • County administrative board. • National and EU laws • City master plans • Research results take a long time before they reach and are adopted by municipalities. • Pilot projects rarely become long-term practices. • Soil and green areas are considered a small, lowp riority part of construction projects and are undervalued. • Validating soil quality is essential but not routinely implemented. • Many stakeholders find the terminology and language complicated. **Drivers** • In future the soil monitoring law will impact the soil use	**Barriers** • Improving soil at large scale is expensive • Expensive machinery, staff time consuming • New material is expensive • Available components for soil products • High cost of projects coming to a standstill combined with low cost of excavation and transport away • Limited local resources • No one is legally responsible for pollution, which means that a lot of government subsidies are needed. • Time is money • Currently insufficient budgets allocated for soil in municipal and construction projects. • Common perception that "soil can be fabricated," reducing willingness to invest in high quality soil or soil restoration. • Drivers • Greener city is more attractive and attracts higher land prices	**Barriers** • Lack of knowledge • Ecosystem services in soil have only recently become widely known; general knowledge remains low. • Poor understanding of soil physiology and its link to ecosystem function. • Many different actors are involved, making coordination challenging. • Differing expectations of what a "nice green area" is—e.g., preference for closely cut grass rather than biodiverse vegetation. **Drivers** • Growing awareness that soil provides ecosystem services, even though the understanding is still limited. • Increasing education and lectures on soil topics. **Risks** • No incentive in personal level to engage • plastic from organic waste, • Soil=dirt • Fear of Nature

under review

POLITICAL	ECONOMIC	SOCIAL
• The county administrative board, National and EU laws, Environmental program policies, Geological survey of Sweden, Swedish geotechnical institute, the Swedish chemical agency, the Swedish environmental protection agency and the Environmental court all drive the Swedish soil framework • The Swedish Environmental Protection Agency sets threshold values for sensitive land use (*Naturvårdsverket gränsvärden känslig markanvändning*). • ISO standards relevant to soil and environmental management • AMA (the Swedish construction specification system) now includes biochar. **Risks** • Exploitation vs. Access to the land that is possible to exploit (avoid widespread urbanization) • Exploitation vs. Biodiversity • Exploitation vs. Farmland • Environmental judgements • Energy, solar cells and mindpower plants vs. Land (foremost farmland) • If soil continues to be undervalued politically, it will not be integrated properly into planning routines. • Lack of long-term policy support may lead to discontinuity and loss of knowledge between projects. **Opportunities** • Developing new norms for urbanization which ensures sustainability • The new soil monitoring law • City master plans • Environmental judgements • Energy, solar cells and mindpower plants vs. Land (foremost farmland) • Sweden should be self-providing e.g. we need farmland • Municipal ownership directives (*ägardirektiv*) may soon include policies on biodiversity. • Universities and research institutes provide scientific basis for decisions.	• Carbon sequestration in soils can be used in climate accounting and could create financial incentives. **Risks** • Governmental goals for soil improvement • Weeds in natural soils • Time is money, including for the participation in Living Lab activities • Continued underfunding may lead to degraded soil quality and poorer long-term environmental performance. • Projects may choose cheaper, low quality soil substitutes that undermine green infrastructure goals. **Opportunities** • Production of biochar from different sources in the city and supply form municipality • Producing good compost from city waste • Local involvement of citizens in household waste, citizen financial kickback • Compensation for compost/biogas • Explore the incentives we have for soil restoration • Carbon credits for storing soil carbon • Apply for government grants for polluted prioritized areas • Local management of stormwater • If soil is recognized as a valuable resource, it could open new funding streams and budget allocations. • Potential for climate-related financial mechanisms (e.g., carbon credits tied to soil carbon).	• Lack of knowledge • Overreaction with fear when info of contaminants is shared to the public • Low awareness can lead to resistance to practices that protect or enhance soil health. • Misconceptions about soil and green spaces may result in decisions that reduce biodiversity and ecological resilience. **Opportunities** • School composts and school gardens • Local community gardening • Raising awareness in healthy soil • 3-30-300 a research-based planning principle for greener cities, developed by Cecil Konijnendijk. • Trend of interest in growing own food in garden allotments • Engagement and dialogue processes can bring more actors on board. • Mandatory training for personnel involved in building and maintaining green areas could raise competency and improve outcomes. • Rising interest in ecosystem services may create social momentum.

TECHNOLOGICAL	LEGAL	ENVIRONMENTAL
Barriers • Communications between professions • Standard that locks you in the old solutions and prevent innovations • Many technical solutions depending on sectors to co-exist • Lack of creativity and fantasy **Drivers** • Standards for new solutions	**Barriers** • Ground water protection • Soil directives • Many actors that are involved and have different legal rights leads to conflict of interest • Time consuming processes • Reference work (AMA) **Drivers** • Soil directive	**Barriers** • Clean circular flows vs. Economy and energy efficiency; Difficult considerations are the circular flows known quality wise • How to reason about the immobilisation of pollution • Water and soil are planned within community borders which makes storm water management difficult

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• Together we came with new ideas and solutions (expert inputs) • Geotechnical analysis and penetrometer • Soil analyser • Field measurements and equipment **Risks** • New soil substrates, • Costly technical solution • Big scale implementation is not safe • Lack of competence among stakeholders • Lack of accessible material (soil) **Opportunities** • New substrates • Sensors for humidity temperature, light, growth, • Many competences identified in the Living Lab team • Required skills; our networks with many skills • Soil assesment tools available, as well as hydrological models.biological inventory, and GIS applications • Existing tools could be further developed • Heterogeneity in soil • Citizen science, data collection etc	• Remove certain elements from circular systems • Soil directives prioritize urban soils (and financing) • Reference work (AMA) • Common scene • Swedish environmental protection agency • Environmental code • Planning and Building Act • Code of conduct **Risks** • Conflicting laws • New solutions are not accepted legally (based on some laws) **Opportunities** • Green space factor • Economic policy instrument that promotes circularity • Reuse of excavated material	• Municipalities are not completely onboard with nature-based solutions • Conflict within planning e.g. exploitation and soil • Green washing • Lack of green spaces • Reduce transport of soil **Drivers** • Heat island effect derives innovation • Increased awareness • Climate pressure drives the work onwards with soil • URSOILL LLs **Risks** • Invasive species, more expensive to buy perennials that are produced in Sweden. • Extreme weather events • Cloud berth frequency • Summer drought • Frost and thaw cycle **Opportunities** • Applied ecosystem thinking • Functional density of green spaces in urban development

2.2.6. PESTLE analysis cross-LL

Across the 5 LL, the PESTLE analysis reveals several barriers, as well as drivers, that are recurring:

- All Living Labs have identified a limited public understanding of soil as a living ecosystem, with certain Living Labs quoting the perception that 'soil is dirty'
- Financial burden for urban soil restoration and healthy soil preservation is a pressure listed by all, including maintenance costs for new green spaces in restored areas, costs of machinery and human resources needed for large-scale restoration
- All Living Labs mention the use of digital tools and sensors for soil monitoring, data collection, and the creation of GIS-based maps to enable evidence-based interventions

Certain topics are mentioned in a majority of Living Labs, but not all:

- The Soil Monitoring Law[10] and its transposition into national law is cited by all Living Labs but EL LL as a major political and legal driver that may have the potential to force the integration of soil health into municipal planning
- The 'wicked problem' of urban expansion vs. no net land-take: housing and infrastructure directly competes with soil protection is mentioned by all but EL LL (IT referring to compensation measures, LU to avoidance measures, as an environmental challenge in ES, and as a source of conflict in SE)
- IT, ES and SE LLs highlight the circular economy of soil (waste) and land as an opportunity for circularity, with Luxembourg placing emphasis on soil reconstruction and amendments

[10] Directive (EU) 2025/2360 of the European Parliament and of the Council of 12 November 2025 on soil monitoring and resilience (Soil Monitoring Law), OJ L 2025/2360, 26.11.2025, ELI: http://data.europa.eu/eli/dir/2025/2360/oj

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- IT, ES and SE LLs mention administrative complexities (bureaucratic procedures in IT, administrative fragmentation in ES, atomicity of stakeholders and perspectives in SE leading to land use conflict)

Interestingly, several contextual elements were also mentioned only in one Living Lab:

- EU funding (through the European Structural Investments Funds such as ERDF and JTF) was only mentioned in EL LL as a key financial lever
- IT LL specifically mentioned a holistic perspective to soil health whereby soil health is improved in an effort to protect promote children's health, in line with the One Health approach
- LU LL refers to a specific planning concept for soil health (the Sponge City concept)
- Spain LL refers to the rigidity of school curriculum acting as a barrier to improve soil literacy
- ES LL refers to a specific legal barrier with a definition of "playground" by the regional Department of Education which fails to integrate nature, and as such may be an issue for schoolyard interventions
- SE LL mentions that the AMA (construction specification system) already formally includes biochar

In general, the PESTLE results will inform the immediate development of URSOILL Living Labs and larger conversation the project wants to foster on urban soil health at the European level.

Specifically, in T1.2 the identified barriers (e.g., bureaucratic fragmentation or soil literacy gaps) and opportunities (e.g., upcoming EU Soil Monitoring Law) are used to refine the Healthy Soils Living Lab (HSLL) framework, as well as for developing stakeholder recruitment and engagement strategies responding to the specific motivations and pressures. Similarly, the barriers and opportunities are directly linked to the technical and operational design of the experimental work in WP2, as well as the identification of potential social, technical, regulatory, etc. risks, and the development of mitigation strategies if needed. More broadly, the results will inform transversal learning on common topics as part of Cross-LL workshops, as well as the future CitySoilHealth Knowledge Forum (CKF) under Task 1.4, in an effort to ensure that URSOILL experiments have scalability and transferability potential.

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3. Conclusion

The ecosystem mapping process was completed efficiently by Living Lab partners, despite inherent complexities and different levels of familiarity with research processes.

The site mapping phase was complex due to necessary revisions requested by the European Commission to ensure all URSOILL experimental sites had an urban character. The stakeholder mapping exercise went smoothly: it resulted in systematised list of >300 actors across the Quintuple Helix and an improved understanding of the open character of the Living Lab process.

From conversation with the LL, the actors they chose to map and the results from the PESTLE, POLIMI and iUE, who contribute expertise in urban planning and policy design rather than technical soil science, anticipate a need for capacity-building throughout the project to ensure that URSOILL co-creation process is designed and implemented to look beyond the development of site-specific technical soil solutions only, expanding into improving urban soil health for the

purpose of healthy, liveable urban environments. This vision is operationalised through the Healthy Soil Living Lab (HSLL) framework, which provides a comprehensive perspective on managing urban soil health for sustainable urban development.

The mapping results serve as the primary intelligence for several subsequent work streams within WP1, they act as direct inputs for the following tasks:

- Refining the HSLL framework, creating activation strategies, and establishing internal LL governance structures in T1.2 to prepare URSOILL Living Lab Methodology (D1.2), due in June 2026, which is intended to serve as the guide for the project's co-creation processes
- Forming the engagement baseline for the co-creation sessions already initiated in T1.3
- Informing the design of the soil literacy investigations to be conducted by T1.5
- Feeding into the selection of priority themes for the upcoming CitySoilHealth Knowledge Forum (CKF) in T1.4

Operationally, WP1 has already planned two follow-up Cross-LL Workshops for the coming months, which will build the ecosystem mapping baseline to facilitate dialogue within and between the Living Labs to work towards the next steps of their co-creation process.

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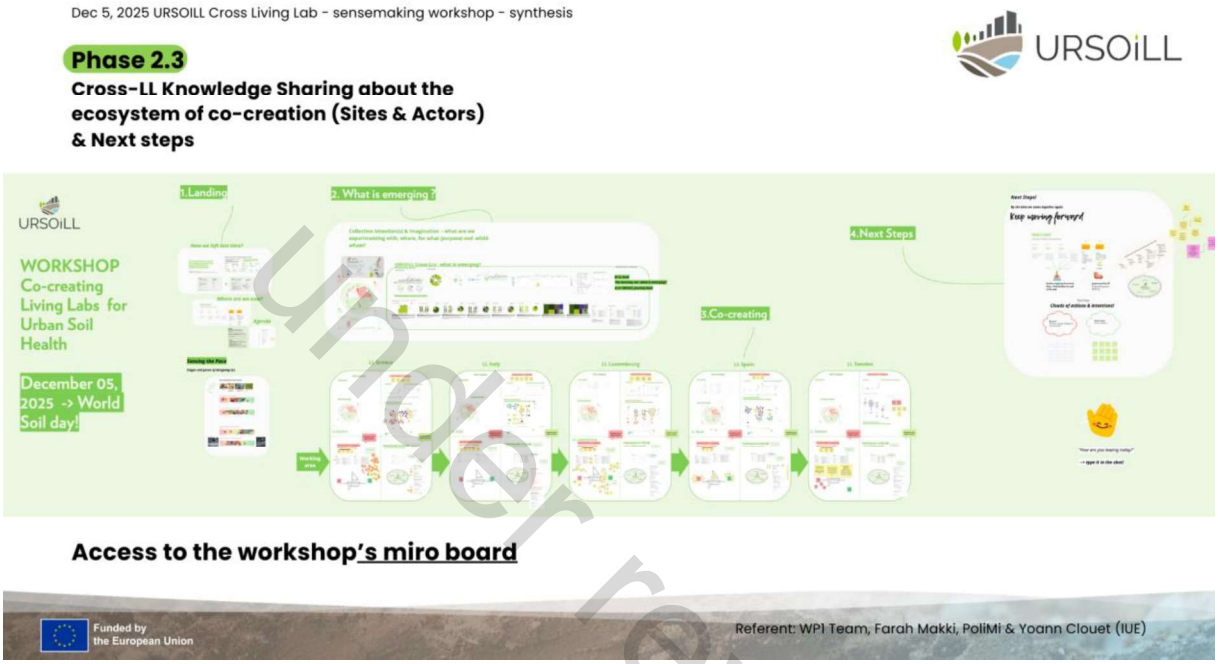
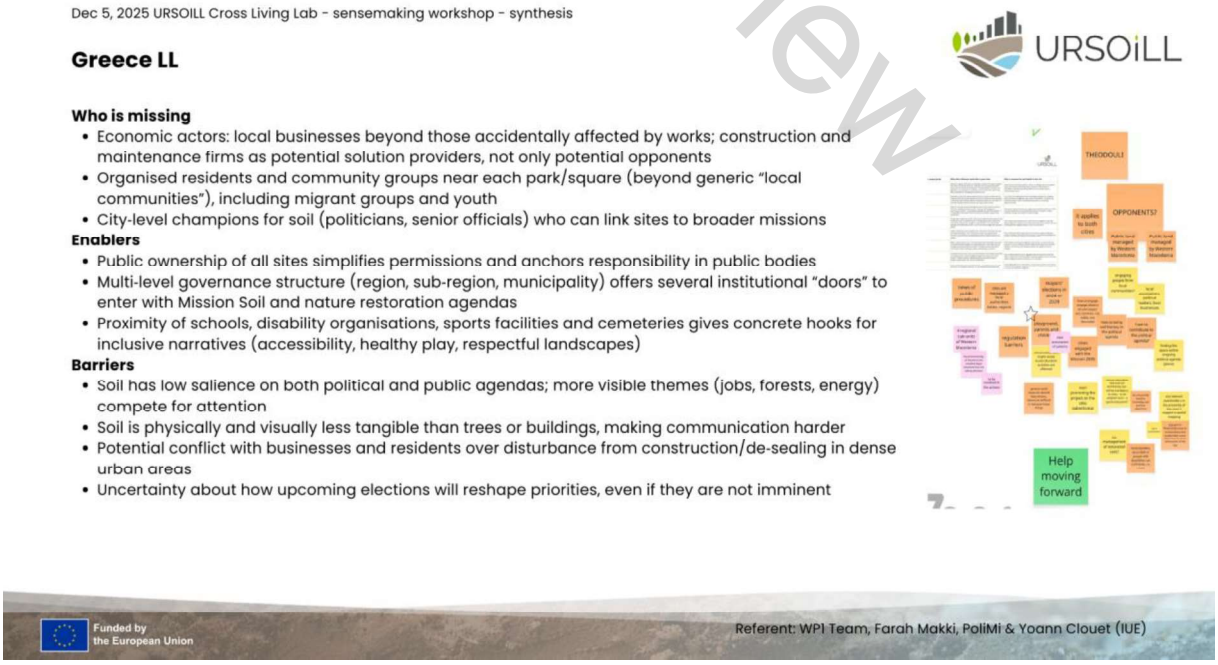
Annex 1: Dec 05, 2025 - Sensemaking reports post cross-LL co-creation workshop.

What is emerging in our ecosystem of co-creation? Who is missing and should be included in our stakeholders' maps? (based on cross-LL workshop feedback loops)



Greece LL



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Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Greece Living Lab

Key findings

o All Greek sites are publicly owned, involving parks and public spaces with multiple overlapping interests.
o No clear "adversaries" identified yet, but several latent opponents are possible (e.g. businesses affected by long construction periods).
o Soil is not high on the political or public agenda compared to issues like labour or more visible strategies such as afforestation.

Proposals / next steps

o Use existing political levels strategically: region → sub-region → municipality → local communities (even though local communities have no formal decision power, they are valuable as "thermometers" of needs and sensitivitie).
o Bring soil onto political agendas by linking to:
- Local 2030 environmental plans of Kozani and Ptolemaida,
- the Nature Restoration Law and upcoming Soil Monitoring Law as entry points.

o Use fine-grained site mapping to identify site-based stakeholders: schools, parents and children, disability associations (e.g. for universally accessible social gardens), cemetery management, sports clubs and associations, local businesses impacted by works.

Identified outreach strategies	1) Use detailed, site-level mapping to approach nearby schools, parents, children, disability associations, cemetery management, sports clubs and local businesses around each park/square. 2) Engage political and institutional stakeholders by framing activities within existing 2030 missions, environmental plans, and as contributions to the Nature Restoration and Soil Monitoring laws.

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Italy LL

Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Italy LL (Milan & Turin)

- **Who is missing**
  - Economic actors: engineering and construction firms, soil/compost suppliers, food-system businesses linked to urban agriculture, who could co-develop and later scale solutions
  - Clear end-user groups for each site (gardeners, residents in adjacent housing, school communities, visitors to parks/forests)
  - Advocacy and civic groups that could support contested interventions (e.g. de-sealing, use-change of spaces)
- **Enablers**
  - Strong presence of public and semi-public actors (municipalities, ERSAF, universities, NGOs around cascine) already active in environmental projects
  - ARPA and other regulators can legitimise experiments and translate them into recognised remediation or monitoring practices if they are brought in early
  - Existing urban-agriculture ecosystems (farmers' networks, educational farms, agro-ecology schools) offer ready communities for co-creation and demonstration
- **Barriers**
  - Very strict national/regional regulation on urban soil remediation; any innovative intervention risks being blocked or slowed if it does not fit established categories
  - Incomplete definition of solutions and test plots makes it difficult to specify "who benefits", slowing stakeholder commitment
  - Current maps lean heavily toward institutional/technical actors, which risks reproducing top-down dynamics and overlooking everyday users

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Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Italy Living Lab (Milan & Turin)

Key findings

o Stakeholder list was extended for Turin and Milan to better reflect actors around experimental sites, especially technical providers and regulators.
o Environmental agencies ARPA Piemonte/Lombardia are seen as both potential ally and potential constraint because of strict soil remediation regulations.
o Adversaries and end users are still poorly defined; benefits and direct beneficiaries depend on final solutions, which are not fully fixed yet.

Proposals / next steps

o For Turin: add potential soil analysis and technology providers and explicitly consider ARPA's role (facilitator vs. barrier).
o For Milan:
- broaden the map to include forestry agency ERSAF, local NGOs (e.g. Cascina Nosedo association), schools, urban agriculture networks and farmers' groups.
- view the City of Milan as both ally and possible opponent depending on compatibility with remediation regulations.

o Strengthen the "economic" layer of the mapping (business and market actors) and refine identification of end users around urban agriculture and residential sites.

Identified outreach strategies	1) Expand and then contact a broader set of actors (ARPA, ERSAF, schools, urban-agriculture networks, NGOs, farmers' groups) linked to experimental sites. 2) Invite regulators and municipalities early into co-design sessions so that solutions are shaped together and fit remediation rules, rather than being presented only for approval.

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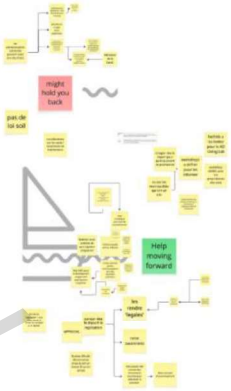
Luxembourg LL

Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Luxembourg LL

- **Who is missing**
  - Grassroots and neighbourhood-scale actors (committees, citizen assemblies, informal groups around each site)
  - National-level policy entrepreneurs beyond the one administration already in the consortium (e.g. ministries of planning, finance, environment with influence over de-sealing subsidies)
  - Large private landowners and developers beyond the flagship example (e.g. Arcelor Mittal) whose land-use decisions strongly affect soil
- **Enablers**
  - Municipalities own the sites and are already engaged, making them strong anchors for implementation and maintenance
  - Presence of a national administration inside the project provides a direct channel to policy discussions
  - Ongoing national debates about de-sealing and nature-based solutions create a receptive context for turning experimental outcomes into frameworks or guidelines
- **Barriers**
  - Absence of an integrated national soil law that connects land-use, contamination, de-sealing and ecosystem services, which makes soil policy fragmented
  - Risk that municipalities accept pilot interventions but are unprepared for long-term maintenance costs and organisational implications
  - If national administrations are not fully on board, regulations and funding schemes may lag behind experimental practice, limiting replication



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Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Luxembourg Living Lab

Key findings

o Actors and municipalities where sites are located are natural key partners; national administrations are more complex but are already represented in the project.
o Stakeholder mapping is advanced but could better cover grassroots actors (neighbourhood committees, participatory assemblies).
o There is currently no comprehensive national soil law; de-sealing lacks a robust regulatory framework, although future transposition of the Soil Monitoring Law may change this.

Proposals / next steps

o Involve municipalities and national administrations "from the start" so they can position themselves and are fully aware of experiments.
o Enrich the map with local, neighbourhood-scale organisations around sites, using municipalities' knowledge of existing committees.
o Use Living Lab experiments to inform:
- a possible national framework for de-sealing (e.g. linking subsidies to technical requirements),
- integration of nature-based solutions into planning documents.

o Address from the beginning "what happens after the project": long-term maintenance responsibilities, cost models acceptable to municipalities, and engagement of large land-consuming organisations (e.g. Arcelor Mittal).

Identified outreach strategies	1) Bring municipalities and national administrations into the process from the start via kick-off meetings, ensuring they can follow and position themselves on experiments. 2) Ask municipalities to help identify and involve neighbourhood committees and participatory assemblies around sites to add grassroots voices.

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Spain LL

Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Spain LL

- **Who is missing**
  - End-user representatives for each context: parents' associations, pupils' councils, playground/user groups, local residents using squares, particularly vulnerable groups
  - Stable "caretaker" organisations capable of holding responsibility across political cycles (e.g. long-standing NGOs, foundations, federations of schools)
  - Private-sector actors relevant for scaling (construction/de-sealing firms, soil suppliers, playground companies), which are still vaguely defined in some sites
- **Enablers**
  - Strong focus on soil literacy and courtyard transformation offers highly visible, experiential interventions that can mobilise pupils and families
  - Technical staff inside municipalities and education authorities can provide continuity and buffer political changes if relationships are nurtured
  - Possibility to align with regional education plans, making URSOILL methods easy to adopt and replicate by schools ("we do the homework so they can replicate")
- **Barriers**
  - High turnover of teachers and leadership in public schools threatens continuity of initiatives and maintenance of new courtyards
  - Change of municipal or regional governments can abruptly alter support, introducing new adversaries or deprioritising soil-related projects
  - End users are diffuse and low-power; without explicit representation, decisions may ignore their needs or trigger local resistance

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under review

Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Spain Living Lab

Key findings

o Initial mapping under-represented end users; these are both crucial and potentially resistant (e.g. local associations affected by changes).
o End users are diffuse and hard to define, especially in open public spaces; this complicates representation and long-term stewardship.
o Differences exist between public and private schools: turnover of teachers and leadership in public schools creates risk for continuity of soil-literacy work and maintenance of de-paved courtyards.
o Change of government is seen as a major political risk and potential source of new adversaries.

Proposals / next steps

o Refine mapping to add representatives of end-user collectives: parents and pupils, local associations using public spaces, etc.
o Build "representative teams" around school courtyards to share maintenance responsibilities and ensure continuity beyond individual teachers.
o Recognise change of administration as a structural risk and continue lobbying/relational work with technical staff to buffer political shifts.
o Clarify the role of private sector:
- may be marginal in day-to-day co-creation in some sites,
- but important for replication and scaling, so should be mapped and informed.

o Align educational activities with regional education plans and provide ready-made methods/resources so schools can easily replicate URSOILL approaches.
o Keep space for bringing in new expertise later (e.g. lawyers to interpret norms and policies).

Identified outreach strategies	1) Refine mapping and explicitly invite end-user representatives—parents' associations, pupils, local associations using courtyards and public spaces—to co-creation activities. 2) Align URSOILL methods with regional education plans, preparing plug-and-play materials so schools can adopt and replicate activities easily. 3) Maintain strong ties with technical staff in administrations as stable contact points across political cycles.

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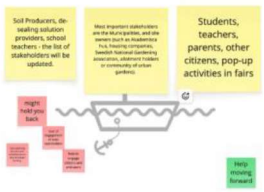
Sweden LL

Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Sweden LL

- **Who is missing**
  - Some key site owners (e.g. housing companies), national gardening organisations and possibly tenant associations who influence access and maintenance
  - Commercial soil producers and de-sealing/green-infrastructure companies as partners rather than just suppliers
  - Broader publics beyond existing gardeners: tenants in adjacent housing, youth groups, cultural organisations
- **Enablers**
  - Municipalities and site owners are already recognised as central stakeholders, giving a strong institutional backbone
  - Sweden has vibrant gardening and allotment cultures; these communities can champion soil health and co-manage interventions
  - Creative outreach ideas (pop-up soil activities at fairs, microscopes to see microbes/nematodes) make soil tangible and attractive to non-experts
- **Barriers**
  - Incomplete contact with key owners (housing companies, national associations) may delay decisions on access, design and long-term use of sites
  - Technical and commercial actors are not yet fully integrated into co-creation, which could limit feasibility or innovation of de-sealing and remediation
  - Without specific plans to reach beyond already interested gardeners, the LL risks staying within a niche rather than engaging a broader urban public



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Dec 5, 2025 URSOILL Cross Living Lab - sensemaking workshop - synthesis

Sweden Living Lab

Key findings
o Stakeholder list needs updates: soil producers, de-sealing solution providers, teachers and other actors were missing from the mapping.
o Municipalities and site owners are considered the most important stakeholders; some key owners (housing companies, Swedish National Gardening Association) have not yet been reached.
o Urban gardening communities and allotment holders are central for the Swedish LL.

Proposals / next steps
o Update stakeholder mapping to include soil/solution providers, teachers and additional site owners and gardening organisations.
o Prioritise municipalities, site owners, urban garden communities and the National Gardening Association for co-creation meetings and ongoing collaboration.
o Develop plans to reach end users (students, teachers, parents, citizens) through:
- targeted engagement,
- "pop-up" and plafyful soil-focused activities at fairs and science festivals (e.g. observing microbes/nematodes with magnifying glasses and microscopes).

Identified outreach strategies	1) After updating the mapping, prioritise invitations to municipalities, site owners, housing companies, the Swedish National Gardening Association, urban garden communities and allotment holders for co-creation meetings. 2) Reach wider publics (students, parents, citizens) through pop-up soil activities at fairs and science events, using simple experiments and microscopes to visualise soil life.

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