URBREATH [101139711]

Systemic Integration of Transformative Technical and Nature-based Solutions to Improve Climate Neutrality of European Cities and Regions and tackle Climate Change: the URBREATH Approach

D5.5 - Local Living Labs report - V1

Project Reference No	URBREATH – 101139711
Deliverable	D5.5 - Local Living Labs report - V1
Work package	WP5: URBREATH Living Labs
Type	R - Document, report
Dissemination Level	PU - Public (fully open)
Date	30/06/2025
Status	FINAL
Editor(s)	Jurgen Silence, VLO Max Beijneveld, CA
Contributor(s)	Beatrice Maria Bellè, POLIMI
Reviewer(s)	Codrut Papina, URB Antonella Tozzi, MUN
Document description	This document is the first in a series of four reports detailing the work carried out under **Task 5.3** on **Local Living Labs** (LLLs). It outlines the initial methodologies, processes, and outcomes, serving as a baseline for future reports that will track the ongoing development of LLL activities within the URBREATH project.

Document revision history

Version	Date	Modifications Introduced	
		Modification Reason	Modified by
V 0.1	March 28th, 2025	TOC	VLO
V 0.2	June 09th, 2025	All chapters	VLO, CA
V 0.3	June 12th, 2025	Update chapter 1, connection WP5 and WP7	POLOMI
V 1.0	June 16th, 2025	Ready for review	VLO
V 1.1	June 20th, 2025	Reviewed version available	URB, MUN
V 2.0	June 29th, 2025	Final editing done	VLO
V 2.1	June 30th, 2025	Quality check	LC
V 2.2	June 30th, 2025	Final version, ready for submission	LC

Disclaimer

The URBREATH project is co-funded by the European Union under Grant Agreement ID 101139711. The information and views set out in this document are those of the URBREATH Consortium only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Executive summary

This first Deliverable under Task 5.3 of Work Package 5 (WP5) documents the progress made in supporting the setup and operation of Local Living Labs (LLLs) across nine URBREATH pilot cities. Task 5.3 plays a central role in guiding the design, implementation, and evaluation of Nature-Based Solutions (NBS) by embedding LLLs as local hubs for co-creation, stakeholder engagement, and on-the-ground testing. WP5 acts as an integrator, linking technical outputs from WPs 3 and 4 (the NBS Toolbox) with local implementation activities.

The Deliverable is structured around the key phases of the LLL framework plan. **Chapter 2** introduces this framework, outlining the phased approach and sequential steps for both front-runner and follower cities to co-design, implement, and evaluate NBS using digital tools.

Chapter 3 documents the "Empathise" phase, with a focus on the "Define" and "Understand" steps. Early work included baseline workshops across all pilot cities to assess current stakeholder structures and participation processes. Cities refined their LLL visions, prioritised use cases, and defined roles critical to LLL functioning—namely, LLL Manager, Stakeholder Manager, and Pilot Manager. All nine pilot sites were geographically and thematically scoped.

In the "Understand" step, pilots deepened their knowledge base and built stakeholder networks. A shared stakeholder mapping exercise was completed, and local context information was compiled. Cities also tested early versions of key tools like the Local Digital Twin (LDT) and the storytelling tool. Workshops enabled cities to exchange practices, refine visions, and align with the overall LLL framework.

To conclude the "Empathise" phase and kick off the "Solution" phase, WP5 hosted four workshops in late 2024. These sessions summarised first-year outcomes, focusing on co-creation readiness and the operational foundation of LLLs.

Chapter 4 shifts to the "Solution" phase. In early 2025, WP5 delivered a series of train-the-trainer sessions tailored to the ideation and co-creation steps. These workshops provided practical guidance, methodologies, and peer learning opportunities for LLL, Stakeholder, and Pilot Managers. In addition to structured training, WP5 supported learning through bi-weekly project and cities calls, a revised "Cities Calls 2.0" format, and regular one-on-one support to pilot teams.

The chapter closes with an overview of pilot-specific LLL initiatives, highlighting examples of local adaptation and implementation of the framework, supported by visual illustrations.

Next Steps (Second Half of 2025)

In the coming months, WP5 will focus on:

- Delivering additional train-the-trainer sessions, particularly around ideation and co-creation, while beginning to prepare for the deployment and evaluation phases.
- Expanding the Toolbox exercise to include modelling tools and e-participation platforms that can support the LLLs.
- Supporting the development and localisation of tools and models through collaboration with WPs 3 and 4 and implementation-focused Tasks 5.2 to 5.6.
- Facilitating deeper collaboration around emerging functionalities, especially those addressing previously non-prioritised use cases.

Monthly pilot city calls will remain a central coordination mechanism, with continuous updates to city use case templates and regular tool demonstrations. WP5 will ensure that these calls stay focused on pilot needs and provide space for feedback and adaptation. Individual support for LLL teams will continue, alongside broader dissemination of WP5 progress to promote transparency and knowledge sharing across the project and with external stakeholders.

Table of contents

List of figures

List of tables

List of terms and abbreviations

Abbreviation	Definition
NBS	Nature-based Solutions
AI	Artificial Intelligence
DT	Digital Twin
GA	General Assembly
ICT	Information and Communication Technologies
KPI	Key Performance Indicator
LDT	Local Digital Twin
LL	Living Lab
LLL	Local Living Labs
LOD	Level of Detail
NBS	Nature-Based Solution
WP	Work Package
XR	Mixed Reality

1. Introduction

1.1 Scope and goal of this deliverable

This first deliverable in a series of four version updates outlines the methodological process of setting up Local Living Labs (LLL) with the URBREATH pilot cities (front-runner cities as well as follower cities) where **Task 5.3** (Local Living Labs) plays an essential coordinative, instructive and supporting role.

The LLL will be used for two primary purposes:

- Co-creatively, with all stakeholders, **selecting and designing Nature Based Solutions** (NBS) in an open and free setting. Including the evaluation of tools that will be used to stimulate and support the co-creative process.
- **Evaluation** of the NBSs after their implementation. This includes the development of monitoring tools to be used for evaluating the NBS at various levels.

1.2 Task 5.3 in relation to other WP5 tasks

As outlined in the Grant Agreement:

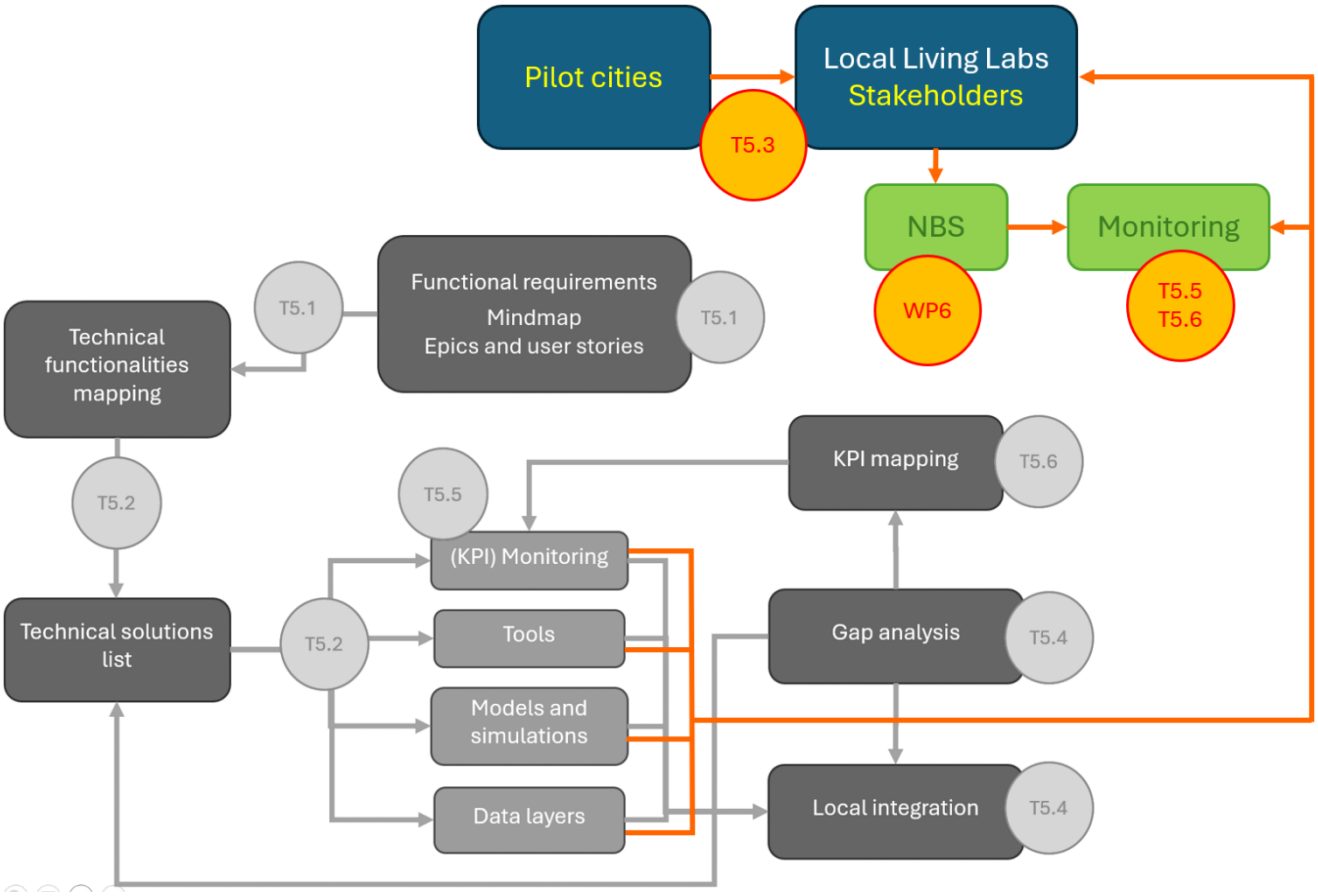
Task 5.3 - Local Living Labs

- M1-M48
- Lead: VLO
- Participants: LC, POLIMI, TAL, DEDA, URB, DBC, BLOX, CA, SPG, TRA, BAS, all cities.
- Each FRC and FLC maps the local and interested stakeholders to involve during the experimentation phase and in function of the creation of sustained partnerships based on business modelling and co-created value. According to the "user journey" described in session 1 (paragraph 1.2.2) and based on experts' knowledge and methods created in T2.1, NBS experts will identify a subset of cost-effective and sustainable NBS scenarios. This will be done using the climate and impact models developed in WP3. The selected subset will be made available to the LL participants during the co-creation process. Co-creation workshops with stakeholders and citizens will be conducted in FRC to agree on the NBS scenario to be implemented (WP6). To this end, LLs participants will visualize the NBS scenarios proposed by the experts by using the decision-making framework (T5.4) and digital twin toolbox (T5.5) customized for the FRC selected urban areas, and the dashboard (T5.5) with the simulated impacts of each scenario (ex-ante simulation conducted in T5.6) in respect to given baselines (T5.1). The subset of proposed NBS scenarios will help co-create new NBS and reach an extended consensus on the most accepted, cost-effective, and sustainable NBS scenarios to be implemented in the selected urban areas, as described in WP6.

To clarify how **Task 5.3** fits within Work Package 5 (WP5) and connects with the other WP5 tasks, we expanded on the visualisation originally presented in Deliverable 5.1, Chapter 1, elements of which are shown in greyscale in the figure below.

The updated figure highlights the **central role of Task 5.3** in guiding the selection, design, implementation, and evaluation of Nature-Based Solutions (NBS). This task acts as a key integrator, making use of the tools provided by the technically focused Work Packages 3 and 4, which together form the project's NBS Toolbox.

Figure 1: Diagram illustrating the interdependencies between Task 5.3 and the other WP5 Tasks and the relation between Task 5.3 and the planning, implementation and monitoring of Nature-Based Solutions (NBSs).



Within the LLL context of this deliverable, the specific roles and inputs of Task 5.3 and the relation to the most relevant other WP5 Tasks can be summarised as follows:

- **Task 5.1 - Functional and technical requirements analysis**
    - Leads the identification and consolidation of functional requirements across pilot cities.
    - Provides support for technical requirement analysis to ensure alignment with functional needs.

- **Task 5.2 - Co-creation and Living Lab (LL) facilitation**
    - Supports the technical analysis process by ensuring that the perspectives and priorities of local pilots and LLs are accurately captured.
    - Ensures effective translation of local requirements into technical specifications.
    - Facilitates communication and iterative feedback loops between technical developers and pilot city representatives, including LL coordinators.
- **Task 5.3 – Local Living Labs**
    - Supporting the setup of LLL
    - Support the monitoring of NBS by LLL
    - Support the development of tools to support the LLL
- **Task 5.5 – Development of monitoring dashboards**
    - Leads the design and development of digital dashboards for monitoring Key Performance Indicators (KPIs).
- **Task 5.4 - Data and infrastructure assessment**
    - Conducts a comprehensive assessment of available data sources and Information and Communications Technology (ICT) infrastructures within the pilot cities.
    - Evaluates the feasibility of integrating URBREATH tools and simulation models into the local digital frameworks and supports the customisation process.
- **Task 5.5 – Development of monitoring dashboards**
    - Leads the design and development of digital dashboards for KPI monitoring of NBS effects.
    - Coordinates with Task 5.6 to ensure that indicators are technically feasible.
- **Task 5.6 – KPI mapping and specification**
    - Identifies, defines, structures, and validates KPIs monitoring NBS effects, in collaboration with the pilot cities.
    - Provides structured input to support both the technical design of monitoring tools and the NBS evaluation framework.

1.3 Connection of T5.3 with other WP activities

WP5 plays a central integrative role within the URBREATH project by embedding LLLs in each pilot city, facilitating co-creation, participatory design, and local testing of tools and Nature-Based Solutions (NBS). Its work connects closely with several other work packages across strategic, technical, and implementation dimensions.

- The link between WP5 and **WP2** lies in the development and alignment of the overall methodology. WP2 sets the strategic framing for co-creation and stakeholder engagement, which WP5 operationalises through the LLL Framework. This framework, co-developed with input from WP2's Task 2.1, ensures that participatory processes in WP5 are fully aligned with the broader goals and structure of the project.

  WP5 also contributed to the development of macro-level use cases in workshops initiated by WP2, ensuring a shared conceptual basis for local activities.

- WP5 works hand-in-hand with the technically oriented **WP3 and WP4**. It acts as the key interface between pilot cities and the development of digital tools, including models, simulators, Local Digital Twins (LDTs), and the e-participation platform.

  Under the coordination of Tasks 5.1 and 5.2, WP5 channels the real-world needs of cities into the technical development cycle, supports testing and feedback, and helps to localise and fine-tune functionalities. The tools from WP3 and WP4 become truly usable and relevant only through the iterative support and integration provided via WP5.

- The relation with **WP6** is focused on implementation. While WP6 oversees the actual planning, execution, and evaluation of NBS in the front-runner cities, WP5 ensures these efforts are grounded in local realities by supporting inclusive co-creation processes through the LLLs.

  WP5 contributed to the discussion on site location changes in cities such as Madrid, Leuven, and Athens, assessing the implications for WP3, WP4, WP5 and WP6. Furthermore, the alignment between NBS planning, stakeholder engagement, and evaluation is maintained through close coordination between the two work packages.

- WP5 also supports **WP7** by identifying training needs from the field and helping to develop targeted capacity-building efforts. WP7 designs and delivers workshops that draw directly on WP5's experience with Living Lab operations, particularly in areas like stakeholder facilitation, NBS deployment, and tool use. This connection is especially relevant for the follower cities, whose development plans (developed in Task 7.2) are informed by the approaches and lessons learned from WP5's Living Lab activities.

In sum, WP5 acts as a vital connector in the project. It operationalises strategy, localises technology, supports implementation, and informs training efforts. Through its Living Labs, WP5 grounds the URBREATH project's ambitions in participatory, place-based innovation that is both context-sensitive and widely supported.

2. Setting up a plan

2.1 The process of planning

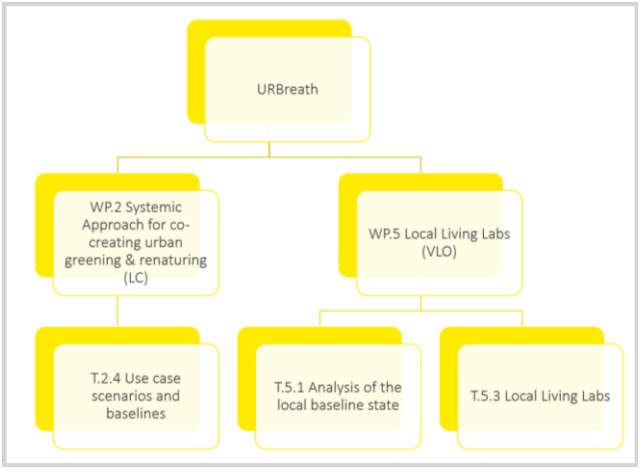
> ***Note:*** *The content presented in this Chapter 2.1 overlaps with that of Chapter 2.1 in Deliverable 5.1, as it provides essential background information required for a comprehensive understanding of both Deliverables.*

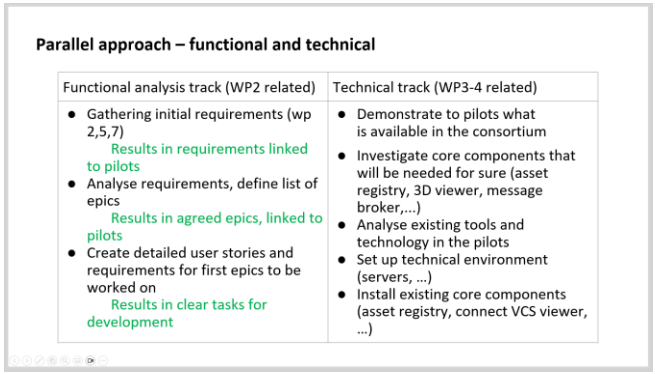
Following the URBREATH project's official kick-off on February 7 and 8, 2024, where WP5 outlined its overarching strategy, targeted efforts were initiated to foster alignment across the involved WPs. WP5 proactively launched a series of cross-WP coordination meetings, specifically bringing together the leads of WP2, WP3, WP4, WP5, and WP7 to harmonise methodologies, synchronise milestones, and consolidate shared objectives.

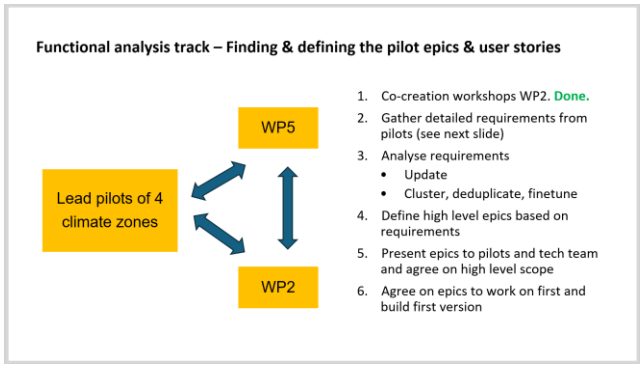
As a result of two workshops organised by WP2 and supported by WP5 in March and May 2024, additional input was gathered to support the development of an integrated, cross-WP strategy. This iterative process, supported by regular presentations in the bi-weekly project management meetings, led to the formulation of a **preliminary operational framework** in April 2024.

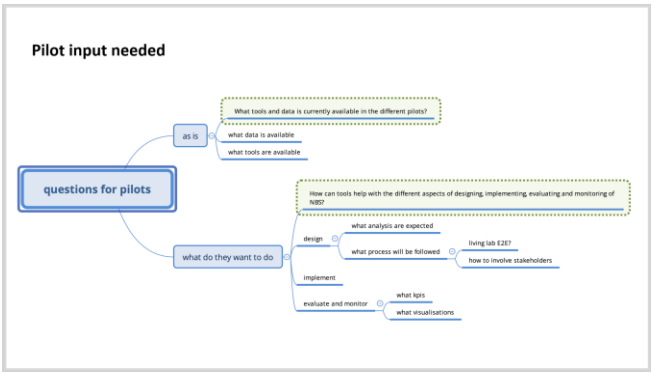
This framework sought to integrate **Living Lab methodologies** and **Design Thinking principles** to ensure alignment with the needs of the pilot cities and the project's overarching ambitions.

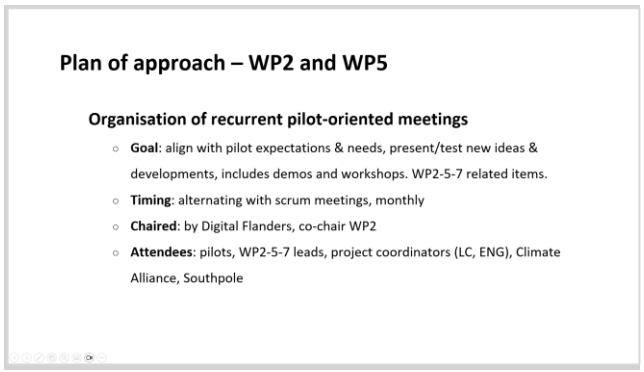
Figure 2: Set of six PowerPoint slides illustrating the key steps and methodologies used to establish the preliminary WP5 operational framework, including the mapping of interdependencies and alignment with other WPs. Presented during a bi-weekly management call, May 2024.

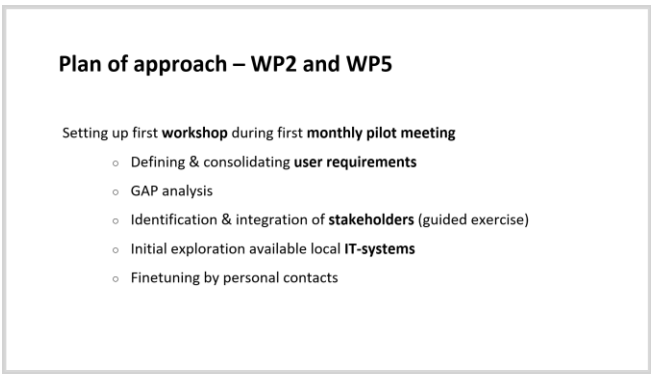








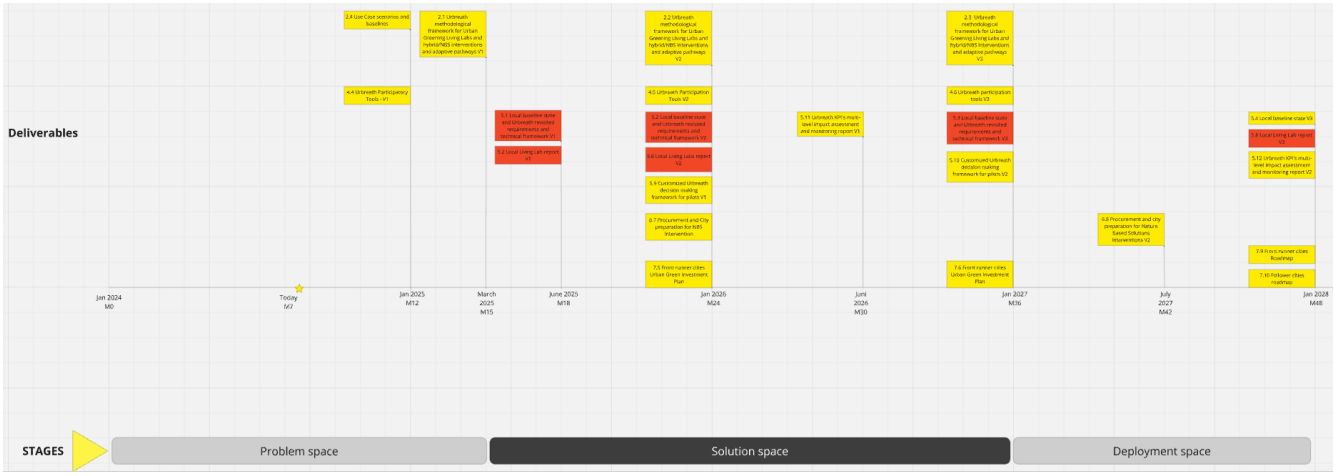




Subsequently, WP5 developed a more refined version of this cross-WP approach and presented the result to the WP2 leads in July 2024.

All URBREATH cross-WP Deliverables were systematically mapped onto a MIRO whiteboard timeline (see figure 3), which also delineates the sequential project phases—problem space, solution space, and deployment space. This integrative visual framework serves as a strategic coordination instrument, offering a shared temporal and conceptual reference point for all project partners and WP leads. It supports alignment of activities, facilitates inter-WP coherence, and enhances the synchronisation of milestones across the URBREATH project lifecycle.

Figure 3: Visual timeline of cross–Work Package Deliverables mapped on a MIRO whiteboard. The timeline illustrates the sequencing of project activities across the URBREATH phases—problem space, solution space, and deployment space—serving as a coordination and alignment tool for all project partners and WP leads.



A second key component (see figure 4) of the preliminary operational frameworks involved the comprehensive mapping of additional key elements onto the MIRO whiteboard timeline. This exercise aimed to support strategic planning and cross-task integration by aligning multiple project dimensions. Specifically, the following components were integrated into the timeline:

1. **LLL objectives aligned with the project phases**, reflecting the stepwise logic of the participatory co-creation process:
    - Preparation of the participatory setting and the supporting toolbox, including tools, methodologies, and guidance materials.
    - Definition and communication of participation opportunities to relevant stakeholder groups.
    - Enrichment of the local baseline with data, expert input, and local collective intelligence to establish a shared understanding of the current and evolving context, including NBS.
    - Generation of ideas, synergies, and representation needs from stakeholder input.
    - Integration and prioritisation of these ideas and functional needs into the design process.
    - Testing, application, and evaluation of ideas through digital tools and monitoring mechanisms.
    - Implementation of the selected NBS configurations.
    - Monitoring, assessment, and iterative adjustment of implemented interventions.
    - Development of a roadmap for scaling and replicating successful approaches.
2. **A sequence of key milestones**, outlining the main stages of progress within the WP5 scope, including the launch of the LLLs, the validation of local baseline conditions, the virtual prototyping of NBS and tool-supported interventions, the development and deployment of digital tools, the implementation of NBS interventions, and the planning for upscaling and replication.
3. **Stakeholder group involvement**, mapping the engagement of various actors across the process phases, including: URBREATH project partners, municipal authorities and decision-makers, technical staff within municipal administrations, expert stakeholders (e.g., academia, civil society, business actors), and local citizens.

This structured mapping exercise contributed to a unified visual framework that supports alignment across the URBREATH project's participatory, technical, and operational streams, while also serving as a reference for synchronising activities across Work Packages.

Figure 4: Visual representation of the second key component of the WP5 preliminary framework, mapping the alignment of LLL objectives, key project milestones, and stakeholder involvement across the URBREATH project timeline. The diagram supports a structured, phase-based approach to participatory co-creation, tool development, and implementation, enhancing coordination and coherence across Work Packages.

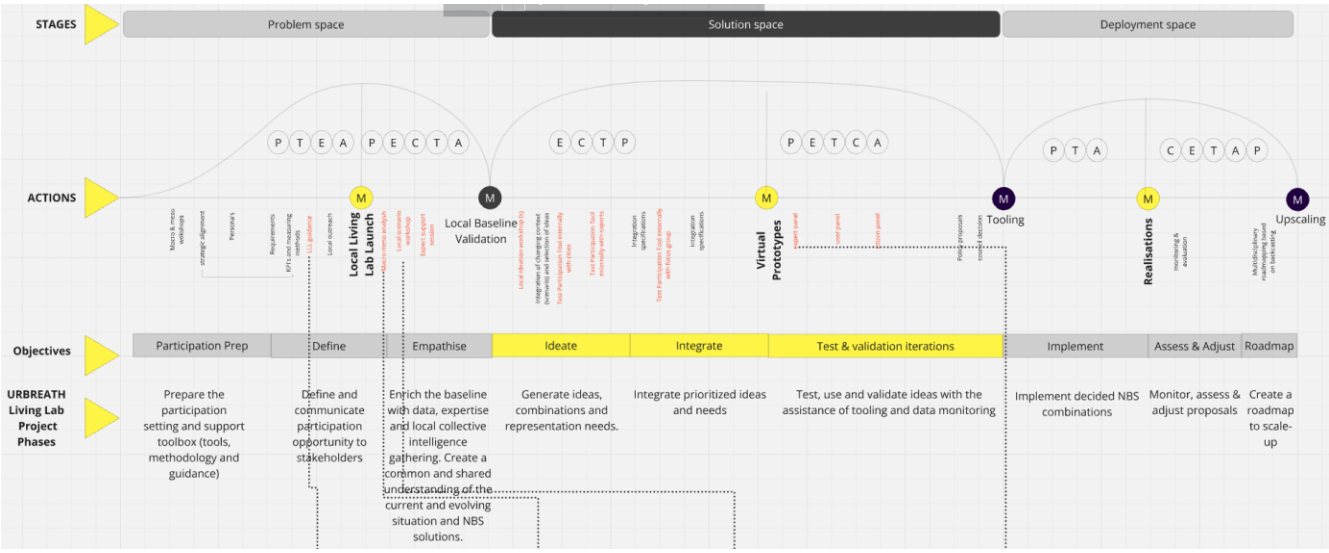
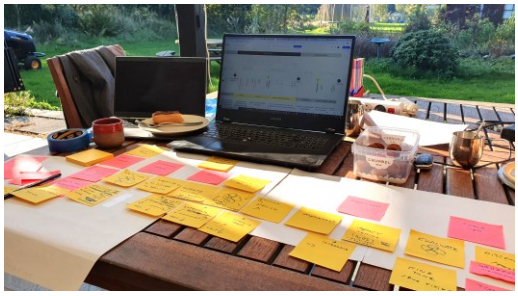


Figure 5: The creative process of finalising the operational LLL framework.



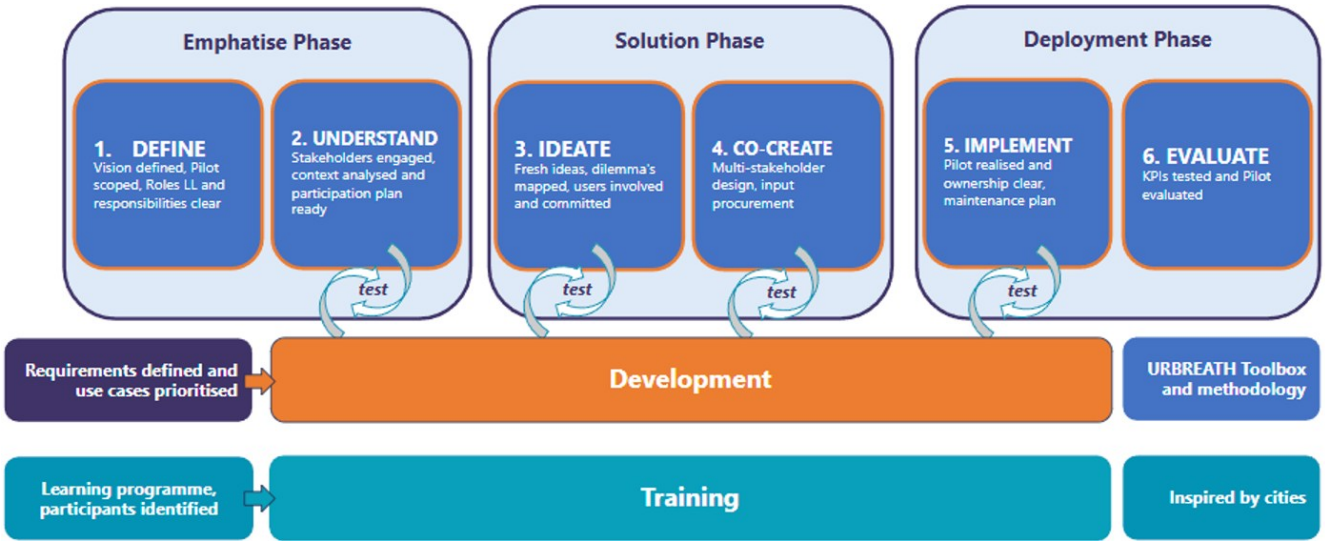
The plan reached its finalised form in October 2024, following a creative workshop between Digital Flanders and Climate Alliance. At that point, it had evolved into a comprehensive, operational, and hands-on roadmap that contextualised WP5's Living Lab activities within the broader scope of the project's phases. It explicitly links WP5's participatory design processes to the technical development streams of WP3 and WP4, as well as to the capacity-building and training activities overseen by WP7.

This plan (see Figure 6) was presented and explained to the pilot cities and validated during the LLL workshops held at the end of 2025. It will be described in detail in the next chapter.

2.2 URBREATH Living Lab framework for Nature-Based Solutions

Building on insights from previous scientific research, relevant EU-funded projects, and the planned activities of the URBREATH initiative, we have developed a comprehensive LLL framework (see Figure below). This framework outlines the key phases and sequential steps that both front-runner and follower cities should undertake to effectively co-design, implement, and evaluate NBSs, supported by advanced digital tools.

Figure 6: Schematic representation of the WP5 integrated framework, structured in three layers: (1) the process timeline outlining the sequential phases and key LLL actions from 2023 to 2027; (2) the digital tool integration layer depicting the iterative development, testing, and refinement of tools and models; and (3) the capacity building layer illustrating the continuous process of strengthening knowledge and skills among local stakeholders.



2.2.1 Overview of the framework

The URBREATH Living Lab framework is structured into three interconnected layers:

- **Process timeline layer** (top row in the figure above): Outlines the sequential phases and critical actions cities are expected to complete between 2023 and 2027 to establish and operationalise their **LLLs** within designated pilot sites.
- **Digital tool integration layer** (middle row in the figure above): Illustrates the development, testing, and refinement of digital tools and models by technical partners, which are co-developed in real-life urban settings and integrated into the URBREATH toolbox.
- **Capacity building layer** (bottom row in the figure above): Represents the ongoing process of knowledge enhancement and skills development for city representatives, facilitated through workshops, training sessions, and peer exchange throughout the project lifecycle.

2.2.2 Description of the phases and core steps

1. **Empathise phase**

The Empathise phase is foundational to ensuring that NBS are contextually relevant and socially responsive. It consists of two key steps—Define and Understand—that facilitate a comprehensive needs assessment in the pilot areas.

- **Define**: In this initial step, local authorities, researchers, and stakeholders collaboratively identify and articulate core urban challenges affecting the pilot area. This involves the systematic collection of qualitative and quantitative data through interviews, surveys, existing reports, and field observations. The aim is to establish a shared understanding of issues such as air pollution, lack of green spaces, accessibility, housing deficits, or public health concerns.
- **Understand**: Building upon the Define step, this phase involves a more nuanced analysis of the collected data to identify the diverse needs and lived experiences of local communities. Stakeholder engagement plays a central role, ensuring inclusivity and reflecting the perspectives of different demographic and socio-economic groups. This step lays the foundation for identifying prioritised use cases and technical or societal requirements for the implementation of NBS at each pilot site.

2. **Solution phase**

The Solution phase focuses on the development of innovative and collaborative responses to the identified challenges. It is composed of two interconnected steps—Ideate and Co-create—which are rooted in participatory design principles.

- **Ideate**: During this stage, stakeholders from across the quadruple helix (public sector, academia, industry, and civil society) engage in structured brainstorming sessions, design thinking workshops, and creative mapping exercises. The objective is to generate a wide range of potential solutions without immediate constraints, encouraging innovation and critical thinking.
- **Co-create**: The most promising ideas are then refined and developed through iterative collaboration. Stakeholders co-design tangible prototypes and pilot concepts, ensuring alignment with technical feasibility, social acceptance, economic viability, and environmental sustainability. This step fosters ownership and builds consensus, increasing the likelihood of successful and scalable implementation.

3. **Deployment phase**

The Deployment phase operationalises the co-created solutions and embeds them into the urban fabric of the pilot areas. It involves two critical steps—Implement and Evaluate—which ensure both action and accountability.

- **Implement**: This step transforms co-developed solutions into concrete interventions, including the procurement of services, allocation of funding, and mobilisation of physical and institutional resources necessary for the realisation of NBS on-site.
- **Evaluate**: Once implementation is complete, the solutions are systematically assessed using a robust set of predefined KPIs, such as environmental quality (e.g., biodiversity, permeability, green cover), social outcomes (e.g., accessibility, safety, public health), and liveability. The evaluation process is evidence-based, drawing on data collected via the digital tools developed and refined during the project. The findings guide future iterations of NBS deployment and contribute to building resilient and adaptive urban systems.

Through this structured LLL approach, URBREATH enables cities to embed innovation in real-life urban contexts. By combining participatory design, iterative experimentation, and data-informed evaluation, the framework provides a scientifically grounded pathway for co-creating sustainable and inclusive NBSs.

3. The empathise phase

3.1 Define and understand steps: founding the Local Living Labs

As part of the URBREATH project's design thinking-based methodology, the Define and Understand stages represent the **foundational steps** in setting up effective and inclusive LLLs across the nine pilot cities. These phases are guided and facilitated by WP5, which supports pilots through structured training, consultation, and knowledge exchange.

Together, the Define and Understand phases lay the groundwork for the successful design, implementation, and evaluation of NBS through LLLs. They ensure that each pilot starts with a well-aligned strategy, informed by local realities and built on meaningful stakeholder participation.

3.2 How WP5 supports these phases

Work Package 5 leads and facilitates both the Define and Understand phases by:

- Conducting **multiple workshops** with all pilot cities to work through each component of the phases
- Providing **training and capacity building** to strengthen pilot teams' ability to design and run their LLLs
- **Stimulating knowledge exchange** between pilot cities, allowing for shared learning and cross-city insights
- Offering ongoing **consultation and methodological guidance**, ensuring consistency across pilots while allowing for local adaptation

3.3 The Define step: setting the foundation

The Define phase focuses on establishing a clear framework and shared vision for the Living Lab in each pilot city. This involves:

- Developing a **local vision** for the LLLs and the NBSs to be explored
- **Scoping the pilot site**, including defining its geographic and thematic boundaries
- Clarifying **roles and responsibilities** among all involved stakeholders, including pilot cities, local partners, and consortium leads
- **Structuring the LLL as a co-creative process**, embedded in real-life settings, with transparent governance and clear operational plans

Expected Results:

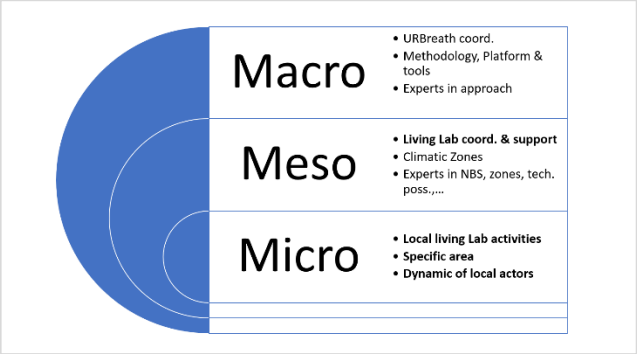
- A clearly defined and shared **vision** for the LLL and its NBS objectives
- A **scoped and contextualised pilot site**, tailored to local challenges and opportunities
- **Well-defined roles, responsibilities, and coordination mechanisms** for the functioning of the LLL

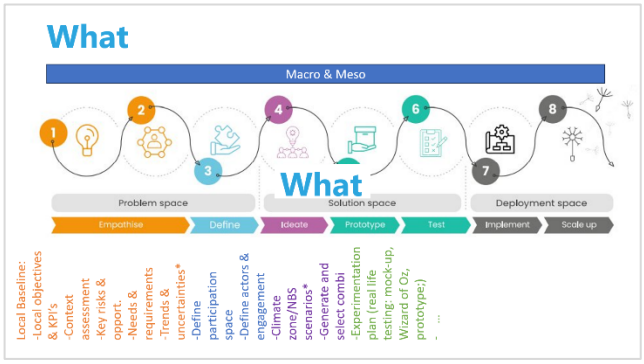
3.3.1 Setting the scene

As a preparatory step, a comprehensive presentation outlining the scope and objectives of WP5 was delivered to all URBREATH pilot cities. This took place during the Personas Workshop, jointly organised with WP2, in May 2024.

The presentation introduced a multi-scalar framework encompassing macro, meso, and micro levels that delineates the contextual factors shaping the implementation of LLLs. Within this framework, WP5 plays a **coordinating and supportive role** by facilitating knowledge exchange and guiding the establishment and management of LLLs at both the climatic zone level (meso scale) and locally within the specific NBS areas of individual pilot cities (micro scale). Additionally, the conceptual foundations of the LLLs were clarified through the systematic application of the five key guiding questions: **Why**, **What**, **Who**, **When**, and **Where**. This approach aimed to ensure a shared understanding among all city partners regarding the purpose, scope, stakeholder engagement, timeline, and spatial context of their respective LLLs. In this phase, five roles were foreseen to set up, manage and run the LLL: the LL manager, a panel manager, a human interaction specialist, a pilot manager and a project manager.

Figure 7: Selection of slides from a presentation introducing the multi-scalar framework (macro, meso, micro) and clarifying the conceptual foundations of the LLLs through the five guiding questions, why, what, who, when and where, supporting a shared understanding across all pilot cities. WP2-WP5 Personas Workshop, May 2025.





3.3.2 Mapping the pilot cities' Local Living Lab baseline state

In May and June 2024, four online exploratory workshops were organised, with a dual focus on the requirements of pilot cities and LLLs. Each two-hour workshop was dedicated to the pilots of one climatic zone.

LLL objective

Adopting a bottom-up and transparent approach, an initial step was taken to identify both the current (as-is) and desired (to-be) states of the LLLs for each pilot site. This effort formed part of the 'empathise' phase—focused on definition and understanding—within the LLL timeline, and contributed directly to Tasks 5.1, 5.2 and 5.3.

As a basis, the pilot-specific use cases, as described in the Description of Action of the Grant Agreement and presented by the pilots during the kick-off meeting in Leuven in *February 2024*.

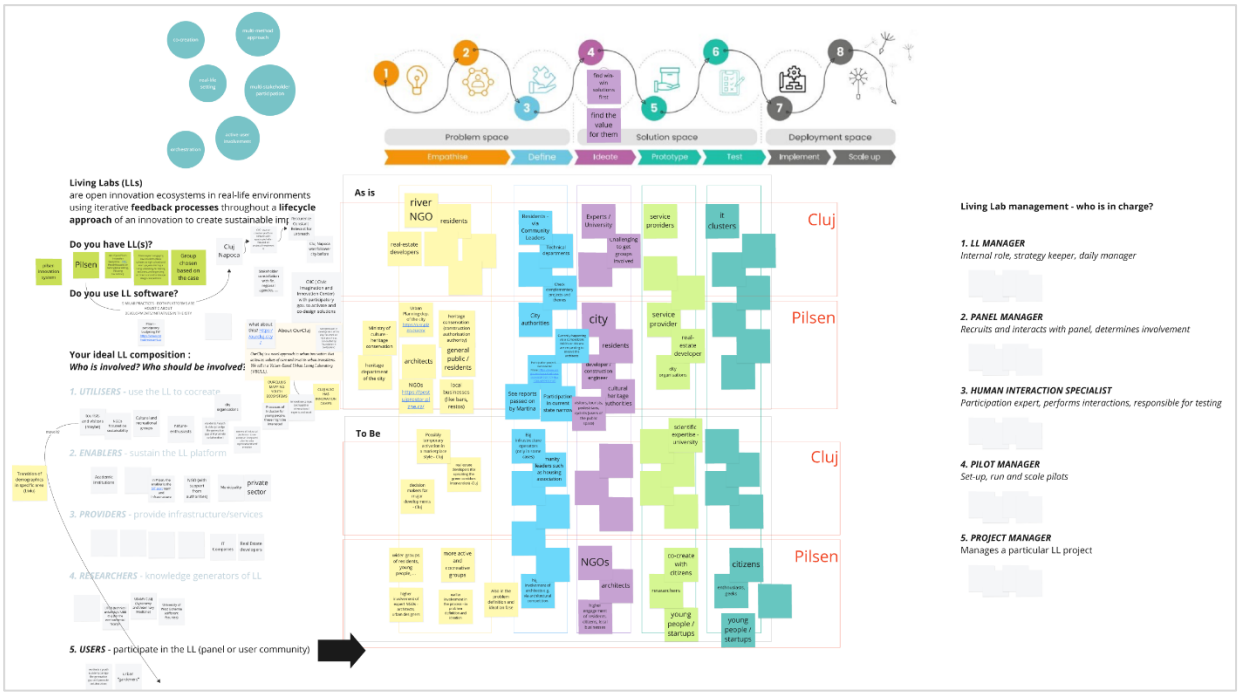
Furthermore, a preliminary monitoring activity was conducted to inform the development of **functional and technical requirements tailored to each pilot.** This activity aimed to systematically capture the contextual needs of each pilot city, particularly regarding the development and deployment of co-creative digital tools to support the operation of LLLs. In addition, it addressed the identification of tool-based mechanisms for evaluating the performance and impact of NBSs. These tools, partially integrated into the LLL framework, are designed to facilitate participatory processes and provide data-driven support for impact assessment throughout the project lifecycle.

Approach - tools and process

An interactive, participative sticky note MIRO whiteboard exercise was organised online.

- During the first half of the workshop, we examined the current (as-is) and envisioned (to-be) state of the LLLs. This included mapping the roles and composition of each LLL, identifying existing local LLL-supporting tools in use, and analysing the user landscape, focusing on those participants who are actively involved in the LLL processes and who provide essential input and feedback across the various stages of the pilot use cases.

Figure 8: MIRO board visual from the interactive exercise mapping the current (as-is) and envisioned (to-be) states of the LLLs, including roles, supporting tools, and active user involvement across pilot use case stages. Exercise done with the Continental Climatic Zone pilot cities, June 2024.



- During the second half of the workshop, focus shifted to identifying the specific tool functionalities and procedural needs of each pilot city. This activity contributed directly to the ongoing functional and technical analyses **detailed in Deliverable 5.1**, where the role and interrelation of various WP5 tasks are comprehensively outlined.

  In relation to Task 5.3 (Local Living Labs), this segment was particularly relevant, as it addressed not only tools for monitoring NBS, but also those designed to actively support the functioning of the LLLs. Notably, this includes digital platforms such as the e-participation tool, which facilitates broad-based stakeholder engagement and co-creation activities.

  Through an interactive method employing colour-coded sticky notes, participants collaboratively mapped existing local resources and identified unmet needs. This process allowed for a structured differentiation between tools and processes required across the full range of project phases—from the initial empathise stage to the final deployment—thus providing nuanced insights into the type and granularity of feedback required by the URBREATH pilot cities.

Outcome

As a result of the MIRO board exercise, we had an initial idea of:

- The LLL status and the availability and **stakeholder mapping**.
- An analysis of the organisational capacities and operational contexts of the URBREATH pilot cities revealed that the implementation of a highly complex LLL governance structure is **not required**. Based on this assessment, the initially proposed five-role framework (see chapter 3.3.7) **was streamlined to three essential roles**, ensuring both feasibility and functional adequacy in supporting the co-creation and implementation processes within the LLLs.
- Expectations and needs concerning LLL tools, processes and functionalities for each stage of the pilots' use cases connected to the URBREATH project.

We processed the information received and used the outcome as a basis for the second series of workshops.

3.3.3 Deep dive into Local Living Lab participation processes and tool requirements

WP5 organised two workshops in mid-July 2024, building on the outcome of the first series. During the two-hour participative sessions, the efforts of two climatic zones were combined. This set of workshops also had a dual focus on continuing the LLL baseline mapping and defining functional requirements.

Objective

Now that the users involved in the pilot cities' LLLs have been identified for both the current (as-is) and desired (to-be) states, the next step is to understand how the pilot cities intend to engage these users in co-creation activities within the LLL. We organised a deep dive, gathering detailed information and insights mapped to all project timeline stages as defined in the LLL framework (see Chapter 2.2).

Furthermore, this exercise served as the basis for creating a cross-pilot mind map (July 2024) and defining functional requirements and epics (grouped functional requirements, July/August 2024) for the URBREATH Toolbox models and tools, *including LLL-supporting models and tools*. This process is described in Deliverable 5.1.

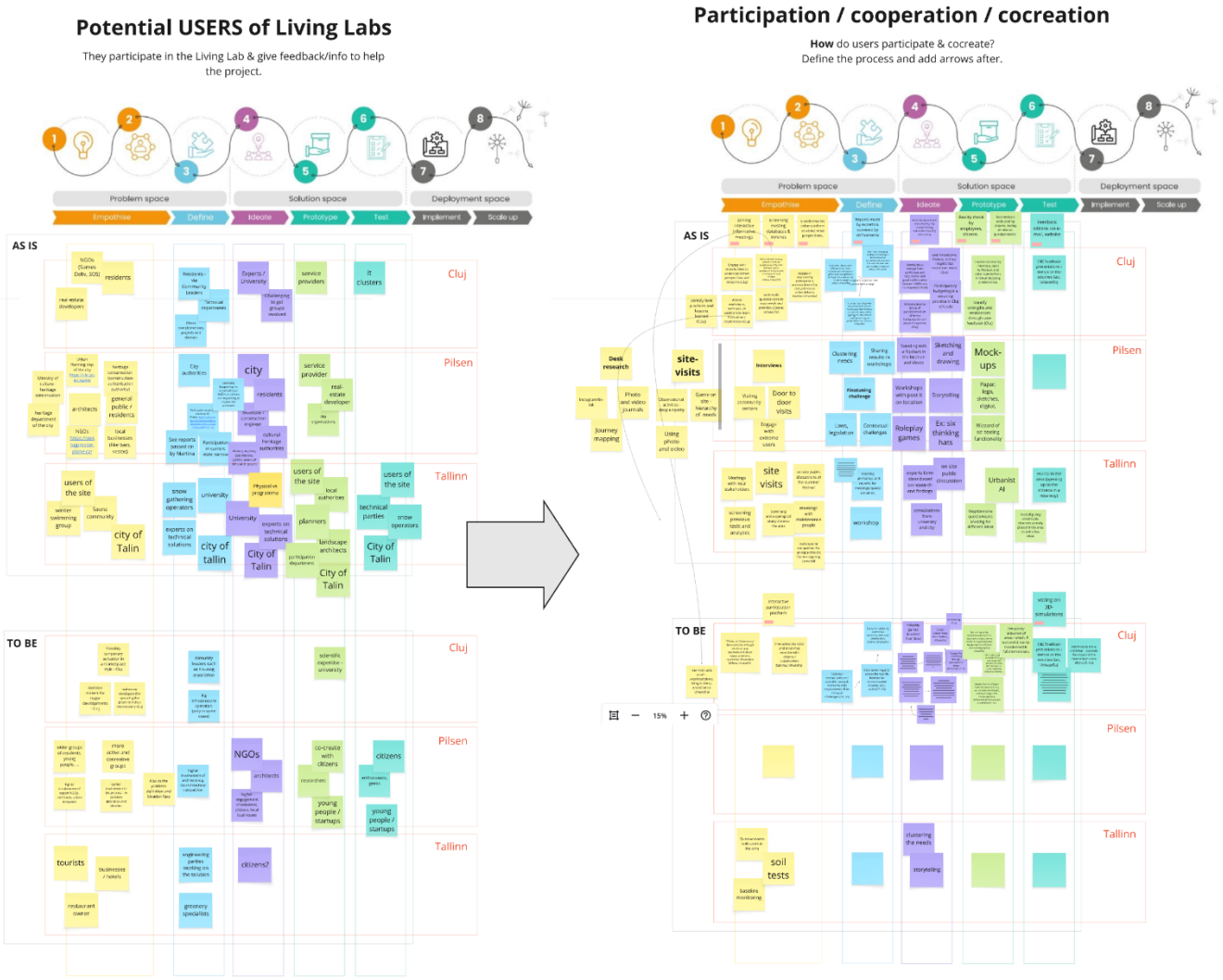
Tools and process

The workshop began by contextualising the exercises performed during the first two workshops within the framework of the project's macro-, meso-, and micro levels, as well as the work of Work Packages 2 and 5. A deep dive was organised based on the processed results of the first series of workshops.

As a Task 5.3 exercise, we continued working on defining and understanding the co-creation and participation aspects of the LLL users, as-is and to-be, for each project phase of the LLL Framework. More specifically, this workshop aimed to explore **how LLL participants engage in participation and co-creation** processes within the LLLs. The focus is on defining and structuring the overall participatory process.

Further, the availability and needs for LLL supporting tools, functionalities and processes were mapped for each phase of the project.

Figure 9: Results of the MIRO whiteboard exercise conducted by Task 5.3, exploring user engagement in co-creation and participation within the LLLs. The visual maps the current and desired participatory processes, as well as the availability and needs for supporting tools, functionalities, and processes across all project phases. Exercise done with the Continental Climatic Zone, July 2024.



Results - outcome

The outcome of this exercise provides a robust foundation for the subsequent phases of the LLL roadmap. Through this exercise, we gain valuable insight into the **existing and desired participation and co-creation processes** for each URBREATH pilot city LLL. It also provides information about participation ambition levels; see further in Chapter 3.4.6. This information was enriched with ad-hoc questions to the URBREATH pilot cities during nine one-on-one meetings with the individual pilots in September 2024.

3.3.4 Further functional analysis of Local Living Lab supporting models and tools

The development of **LLL-supporting models and tools** is comprehensively described in **Deliverable 5.1, Chapter 2**, where a generalised overview is provided, also encompassing models and tools designed for NBS design and monitoring. This development process unfolds through a structured and iterative approach, beginning with an initial mind-mapping of identified needs, followed by the formulation of epics (grouped functional requirements) and the integration of macro-, meso-, and micro-level requirements.

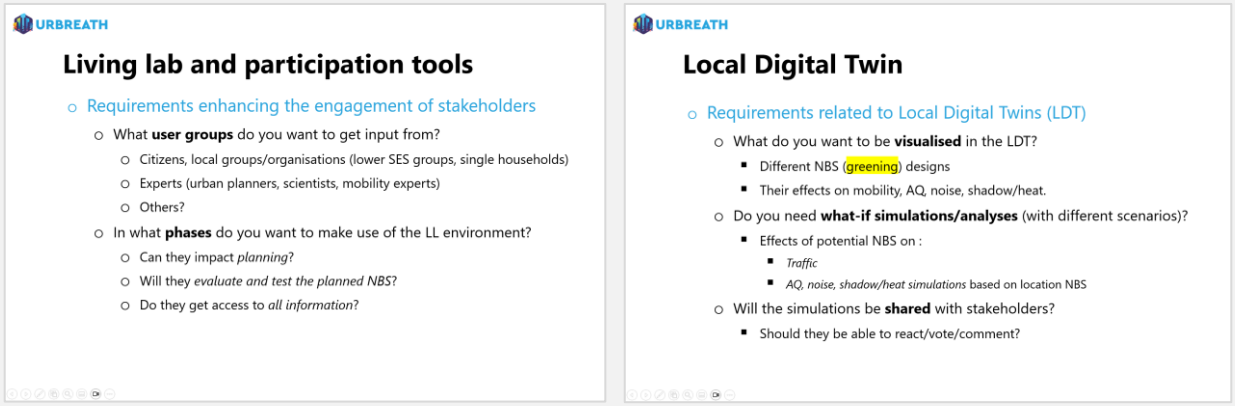
To ensure relevance and contextual alignment, a series of nine one-on-one workshop sessions was held with each URBREATH pilot city in September 2024. These sessions aimed to refine the functional requirements and validate the identified use cases based on local priorities and conditions. At this stage, the development roadmap for LLL-supporting tools and models can be illustrated through two concrete examples:

Example 1

The figure below presents a selection of tailored slides used during a two-hour workshop with the city of Leuven. This session was tailored to the specific local context and stage of progress in Leuven, allowing for a focused and in-depth discussion of all relevant epics. Through a series of targeted, practical questions, the workshop facilitated the elicitation and refinement of functional requirements associated with each epic.

An initial evaluation of available data layers was carried out for tools such as the LDT, the storytelling tool, and other LLL-supporting solutions. Additionally, a preliminary stakeholder mapping exercise was undertaken to identify key actors involved in the LLL. For each of the nine pilot cities, a customised slide deck was developed to support a systematic approach to information gathering and gap analysis.

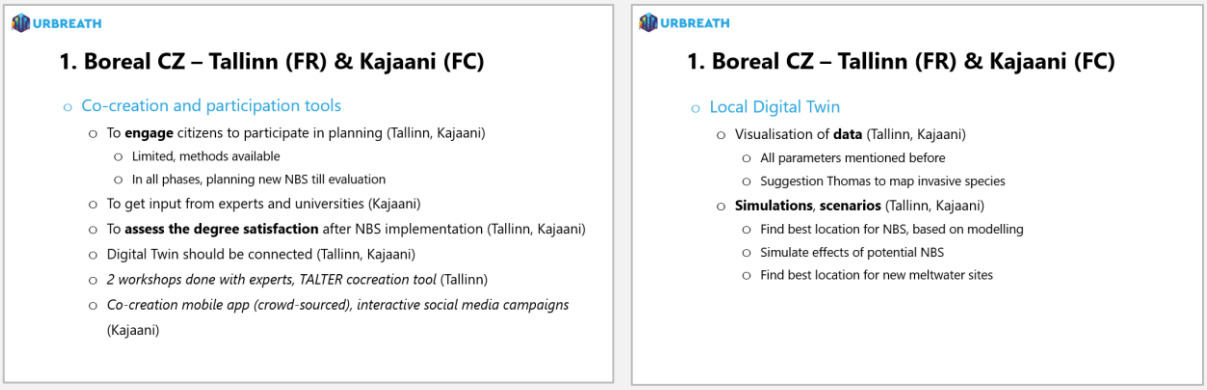
Figure 10: Example from the front-runner city of Leuven illustrating the application of tailored, use case-specific guiding questions to systematically extract detailed insights into local functional requirements and data/model availability, relevant to the deployment of LLL-supporting tools.



Example 2:

Figure 11 refers to activities conducted in October 2024 during the General Assembly in Madrid. At this event, the consolidated functional requirements for co-creation and participation tools, as well as for the LDT, were presented to the entire consortium. These requirements were subsequently validated by all pilot partners. Based on the outcomes of this validation process, a finalised list of functional requirements was compiled and formally transferred to the technical partners for analysis and implementation.

Figure 11: Two examples of a validation and prioritisation exercise on LLL-supporting tools conducted with the Boreal pilot cities, Kajaani and Tallinn, during the General Assembly in Madrid, 2024.



*By completing the definition of technical requirements in this "**Define**" phase of the LLL framework, we can now advance to the subsequent steps related to the design and development of LLL-supporting tools. These will be detailed in Chapter 3.4.4, as part of the "**Understand**" phase of the project.*

3.3.5 Local Living Lab vision

Let us begin by outlining our perspective on the LLLs. We developed a clear vision regarding the concept and framework, which we disseminated to the pilot cities. This ensured that all URBREATH pilot partners were aligned in their approach to establishing and organising the LLL.

3.3.5.1 The role of Local Living Labs in shaping NBS

The establishment of LLLs is essential for guiding the selection, co-design, and evaluation of Nature-Based Solutions in urban environments. Their scientific relevance lies in their ability to integrate diverse forms of knowledge, foster multi-actor engagement, and facilitate experimentation in real-world contexts. Specifically, LLLs support NBS innovation through the following mechanisms:

- **Early-stage user involvement**
  LLLs ensure that local communities and stakeholders are engaged at the earliest phases of NBS development. By embedding end-user perspectives into the decision-making process, LLLs help to align NBS choices with local ecological, social, and cultural conditions, enhancing both relevance and acceptance.

- **Integration of top-down and bottom-up approaches**
  As collaborative governance platforms, LLLs facilitate the integration of institutional agendas (top-down) with citizen-led knowledge and priorities (bottom-up). This dual approach strengthens the legitimacy and adaptability of NBS strategies, enabling more effective and equitable urban transformation.

- **Inclusive, collaborative public spaces**
  LLLs create inclusive, open, and iterative environments where multiple stakeholders, ranging from municipal authorities and scientists to residents and Non-Governmental Organisations, can jointly co-design and test NBS interventions. This transdisciplinary collaboration fosters mutual learning and ensures that ecological functions are addressed alongside community needs.

- **Experimental urban governance**
  By functioning as testbeds for urban innovation, LLLs support the experimental implementation of NBS. This enables iterative prototyping and real-time feedback loops that inform both technical refinement and governance model development, supporting adaptive, evidence-informed decision-making.

- **Solution-oriented urban innovation**
  Through the iterative evaluation of NBS in situated contexts, LLLs contribute to the production of context-sensitive, scalable, and operationally feasible solutions. The continuous assessment of ecological performance, social impact, and governance processes enhances the transferability and resilience of NBS outcomes across diverse urban environments.

3.3.5.2 What a Local Living Lab IS and IS NOT

We communicated our perspective with the URBREATH pilots, highlighting the key elements we consider essential for the effective establishment of LLLs within the URBREATH project.

What a LLL should be

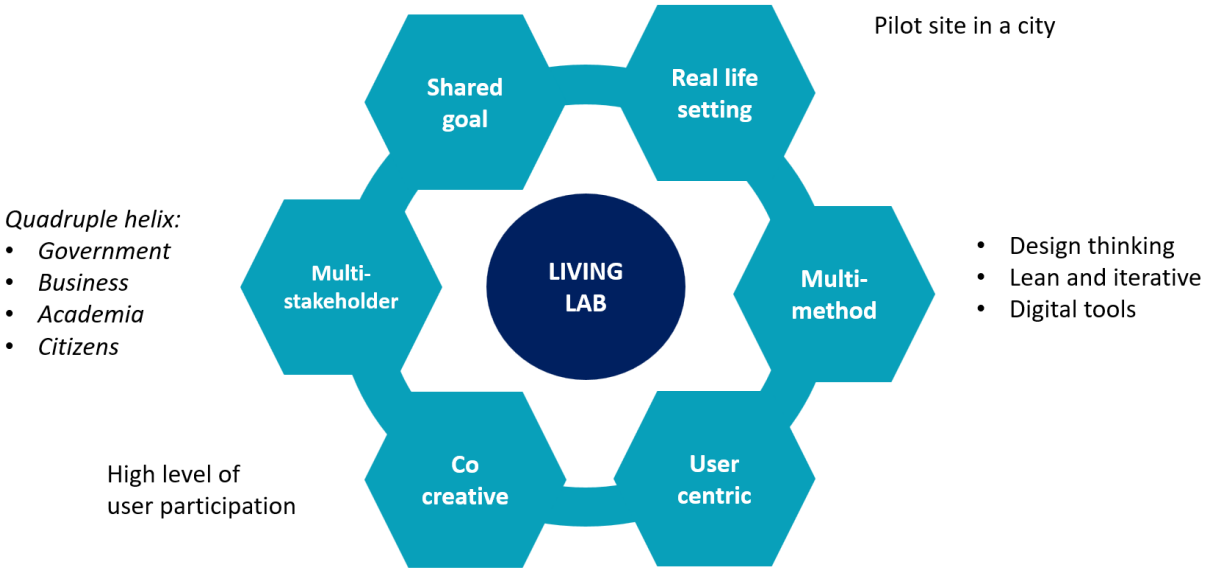
- a **flexible and adaptive innovation space**, grounded in real-life settings and responsive to evolving local needs
- a **collaborative and participative process** that brings together citizens, researchers, practitioners, and policymakers to co-create solutions
- a tool for **addressing complex, "wicked" urban challenges**, such as climate change, inequality, and ecosystem degradation
- a **driver of positive societal transformation**, built on openness, participation, learning, and experimentation
- a framework for **co-selecting, co-designing, and co-evaluating Nature-Based Solutions**, ensuring they are inclusive, effective, and context-specific

What a LLL should NOT be

- a demonstration project that is static, pre-defined, and limited to a fixed set of partners, locations, or solutions
- a testbed focused solely on technological innovation or product development (e.g. the Toolbox we create), detached from social and environmental realities
- a controlled scientific environment designed for standardised, replicable experiments or theoretical validation

3.3.5.3 What makes a Living Lab a REAL Living Lab?

Figure 12: Schematic representation of the core components required to establish a fully operational and functional Living Lab.



A Living Lab is a collaborative innovation environment that brings together diverse stakeholders to co-create, test, and refine solutions in real-world settings. Its effectiveness relies on a set of core properties that shape both its structure and process:

1. The core of every Living Lab lies in the clearly defined, **shared objective** that unites all participants. This common purpose guides the co-creation process, aligns stakeholder efforts, and ensures relevance to local challenges and needs.
2. Living Labs **operate within actual environments**, such as neighbourhoods, public spaces, or pilot sites in cities, where solutions can be developed and tested under real-world conditions. This ensures that outcomes are practical, applicable, and grounded in everyday reality.
3. Living Labs use a **variety of methods to support innovation**, including design thinking, iterative and lean development, and digital tools for engagement, monitoring, and visualisation. This methodological flexibility allows the lab to adapt to different phases and types of innovation.
4. Users—whether citizens, service providers, or other end-users—**are placed at the centre of the process**. Their experiences, insights, and feedback drive the design and development of solutions, ensuring that outcomes are meaningful and accepted by those most affected.
5. A Living Lab thrives on **active co-creation**, involving participants not just as informants, but as co-designers and decision-makers. **High levels of participation** create ownership, foster innovation, and build trust among stakeholders.
6. Living Labs **bring together actors from across the quadruple helix**: public sector, private sector, academia, and civil society. This diversity enables richer perspectives, more holistic solutions, and stronger capacity for scaling and implementation.

3.3.5.4 Common pitfalls and challenges in setting up a Living Lab

Based on the experience of the URBREATH consortium partner **Climate Alliance**, several recurring challenges often emerge when establishing and managing a Living Lab. We explained to the URBREATH pilot cities that recognising these pitfalls early can help ensure a more effective, inclusive, and impactful innovation process:

- **Unclear expectations among stakeholders**. When roles, objectives, and desired outcomes are not clearly defined from the start, misunderstandings and misalignment can hinder collaboration and progress.
- **Failure to deliver on promises of participation**. A Living Lab must go beyond token consultation. If stakeholder engagement is superficial or inconsistent, trust erodes and participation declines.
- **Lack of structure and vague responsibilities**. Without precise coordination, defined roles, and a governance framework, the process can become chaotic, leading to confusion and inefficiency.

- **Low motivation and engagement**. Sustaining active involvement over time requires continuous communication, tangible outcomes, and a sense of ownership among participants. A lack of these elements can lead to disengagement.
- **Imbalanced representation**. Ensuring a diverse and equitable mix of stakeholders from all sectors of the quadruple helix is essential. The overrepresentation of one group can skew outcomes and undermine legitimacy.
- **Individual interests and conflicting Ideas**. Diverse perspectives are a strength, but if not well-facilitated, conflicting agendas can stall progress. Mediation and a shared vision are key to navigating disagreements constructively.
- **Difficulty in assessing and measuring effectiveness**. Living Labs operate in complex, evolving contexts. Without appropriate indicators and evaluation frameworks, it becomes challenging to measure impact, demonstrate value, or adjust strategies.

By proactively addressing these challenges, Living Labs can maintain momentum, foster meaningful collaboration, and maximise their potential to generate locally rooted, co-created solutions.

3.3.6 Sharpening the responsibilities in relation to the Local Living Lab

The roles and responsibilities related to the implementation and operation of the LLLs within URBREATH were co-defined and agreed upon collaboratively by all consortium partners. These responsibilities ensure coordinated action across work packages, pilot cities, and local partners to effectively support the development, deployment, and evaluation of NBSs.

This coordinated division of responsibilities ensures that LLLs are not only implemented consistently across sites but also serve as effective engines for co-creation, experimentation, and transformative urban innovation within URBREATH.

3.3.6.1 Responsibilities of Consortium WP Leads

Each Work Package lead plays a critical role in providing thematic expertise, strategic direction, and operational support across the LLLs:

- **Project management** (WP1): Ensures overall coordination, administrative management, and alignment across project activities, including the implementation of LLL.
- **Strategic direction** (WP2, WP5): Sets the overarching methodology and approach for co-creation processes, stakeholder engagement, and integration of LLL outcomes into the broader project framework.
- **Capacity building** (WP7): Designs and delivers tailored trainings and workshops to build the capacities of pilot cities and local partners in areas such as stakeholder facilitation, NBS implementation, and tool use.

- **Tool development and technical support** (WP3, WP4, WP5): Develops digital tools such as Digital Twin technologies and ensures their effective deployment and adaptation at the local level through close collaboration with pilot sites.
- **Expert knowledge and implementation support** (WP2, WP5, WP6): Provides targeted expertise in NBSs, procurement strategies, and impact assessment, and supports the practical integration of this knowledge into pilot site activities.
- **Communication and stakeholder engagement** (WP1, WP8): Leads the dissemination of project outcomes and ensures visibility and engagement of external stakeholders through communication and outreach activities.

3.3.6.2 Responsibilities of the pilot cities

The pilot cities serve as the main testing grounds for the LLLs and play an instrumental role in translating the project's approach into real-world impact:

- **Establish and operate the LLL**: Lead the creation and facilitation of a local innovation space where stakeholders collaboratively co-design and evaluate NBS.
- **Engage in capacity building**: Actively participate in trainings and workshops to strengthen skills related to co-creation, digital tools, and NBS implementation.
- **Stakeholder and citizen engagement**: Mobilise and involve local actors—including citizens, civil society, businesses, and academia—through inclusive, participatory processes.
- **Provide local data**: Share relevant site-specific data/information to feed tools and models and to contextual adaptation of digital solutions.
- **Test and deploy tools and models**: Collaborate with WP leads to implement and evaluate the usability and effectiveness of digital tools and models in the local context.
- **Implement the pilot and nature-based solutions**: Lead the on-the-ground realisation of the pilot project, including the design, implementation, and monitoring of the NBS.

3.3.6.3 Responsibilities of the Local Partners

Local URBREATH partners act as facilitators and connectors within the LLL ecosystem:

- **Support the establishment of the living lab**: work closely with the pilot city to co-establish and sustain an inclusive, functioning LLL.
- **Participate in capacity-building activities**: join project-wide training efforts to align methodologies and strengthen local capacities for collaborative innovation.

- **Lead stakeholder and citizen engagement**: facilitate meaningful engagement with local communities, ensuring diverse representation and continuous participation throughout the LLL process.
- **Contribute local data and insights**: provide contextual knowledge and data that enrich tool development and support evidence-based decision-making
- **Collaborate in tool and model testing and implementation**: assist in piloting digital tools and models, providing feedback to improve usability and effectiveness.
- **Support pilot realisation and NBS deployment:** work in tandem with the pilot city to implement the physical and social aspects of the pilot project, ensuring successful integration of NBS into the urban fabric.

3.3.7 Key roles in the Local Living Labs of URBREATH

To ensure the successful setup, coordination, and implementation of LLLs across URBREATH's nine pilot cities, we defined a focused set of roles that reflect the specific needs and structure of the project.

While Living Labs in other contexts may involve a broader range of roles, we **streamlined our framework** to include only the most relevant and actionable positions for URBREATH. This targeted selection enables clarity, efficiency, and improved coordination between local actors and the broader project consortium.

Below are the **three key roles** identified and adopted in all URBREATH pilot cities. Together, these three roles form the backbone of each LLL, ensuring that strategic coordination, participatory engagement, and technical execution are all effectively managed and aligned with the URBREATH project's goals.

3.3.7.1 Living Lab Manager

The Living Lab Manager plays a central, coordinating role in the daily operations and long-term strategic direction of the LLL. This role ensures the Living Lab functions smoothly and stays aligned with the broader project objectives.

Key Responsibilities:

- Oversees the day-to-day management of the LLL's activities.
- Coordinates the overall implementation process, ensuring that timelines, goals, and deliverables are met.
- Monitors and tracks progress toward LLL and pilot objectives.
- Serves as the primary liaison between the LLL and the URBREATH consortium, particularly WP leads.

Key Characteristics:

- Strategic, organised, communicative, and able to maintain an overview of both local actions and their connection to the project-wide goals.

3.3.7.2 Stakeholder Manager

The Stakeholder Manager is responsible for engaging and maintaining relationships with all relevant local stakeholders—citizens, community groups, businesses, and institutions—ensuring their voices are meaningfully included in the co-creation process.

Key Responsibilities:

- Identifies, recruits, and maintains contact with a diverse group of local stakeholders.
- Plans and facilitates participatory events such as co-creation workshops, public meetings, and feedback sessions.
- Captures stakeholder input and ensures their contributions are integrated into decision-making and project outcomes.

Key Characteristics:

- Socially engaged, empathetic, skilled in facilitation and community engagement, and committed to inclusion and transparency.

3.3.7.3 Pilot Manager

The Pilot Manager is in charge of the technical and practical implementation aspects of the pilot project, including data provision, tool testing, and deployment of NBSs and digital tools.

Key Responsibilities:

- Provides relevant data, technical input, and site-specific information required for tool development and monitoring
- Leads the setup, testing, and operation of technologies and digital tools throughout the pilot phases.
- Supports and facilitates the implementation of NBSs and deployment of tools and LDTs.

Key Characteristics:

- Technically competent, detail-oriented, hands-on, and able to bridge local implementation with project-level technological development.

3.3.7.4 URBREATH Local Living Lab role allocation

Based on the outcomes of multiple workshop exercises described in Chapter 3.3, in-person representatives from the pilot cities could be allocated to assume each of the three specified roles.

Table 1: Overview of in-person representatives from each URBREATH pilot city, allocated to the roles of LL Manager, Stakeholder Manager, and Pilot Manager, as defined for the implementation and coordination of LLLs.

	Living Lab Manager (SPOC)	Stakeholder Manager	Pilot Manager
Tallinn	Stella	Mariliis/Stella	Stella
Kajaani	Henna-Mari	Team participation Kaajani	Outhi
Leuven	Laura (Elena)	Elena (Laura)	Tim (Laura)
Aarhus	Mathilda	Soren	Kristoffer
Cluj Napoca	Alexandra and Liviu	Liviu + Support US	Alexandra + US, in collaboration with active Local stakeholder
Pilsen	Department of Investments	Project Partner – SITMP Martina	IT support - SITMP Tomáš
Madrid	Paula	Monica	Alicia
Parma	Adriano	Bertolotti	Adriano
Athens	Dimitris	Dimitris	Dimitris

3.3.8 Prioritisation of use cases

The prioritisation of use cases during the General Assembly meeting in Madrid in 2024 marked a key milestone in shaping the direction of the LLL trajectory, helping to define the main focus areas and strategic priorities for subsequent LLL activities.

This prioritisation also played a crucial role in informing other WP5 tasks and guiding the technical developments carried out under WPs 3 and 4. A detailed description of this process can be found in Chapter 2.2.8 of Deliverable 5.1.

Table 2: Prioritised use cases selected by all URBREATH pilot cities during the General Assembly in Madrid, October 2024.

	UC 1	UC2	UC3
Tallinn	Explore NBS locations for treating snow meltwater & understand effectiveness.	Assess residents' satisfaction of redesigned NBS site.	Understand changes in accessibility of the NBS site.
Kajaani	NBS concepts for better water management (flood-proof city).	Cost-benefit estimation for different NBS.	Understanding on biodiversity support mechanisms related to NBS.
Leuven	Get input and interaction with stakeholders to shape their case (using LL and LDTs).	Monitor environmental effects and ecosystem services resulting from the redesign of the square.	Monitor social justice & wellbeing.

Aarhus	Monitor traffic changes after increasing pedestrian zone surface.	Monitor the residents' liveability after NBS implementation.	Simulation of square reorganisation in an LDT environment to inform the community.
Cluj-Napoca	Demonstrate value of NBS (f.i. green pockets) and involve community in co-creation.	Integrate greening simulations in the local digital twin.	Understand changes in shaded areas and CO2 emission after NBS implementation.
Pilsen	Investigate traffic impact of NBS, using a LDT.	Investigate impact on air quality, noise, heat & shadow impact using a LDT.	Monitor the perception of residential quality and safety of the square (after NBS).
Madrid	Centralise past/ongoing studies, plans, interventions for the Villaverde district.	Organisation training/codesign sessions. Centralise existing info about potential NBS Villaverde.	LDT-visualisation of datasets & simulations for better insights of district officials.
Parma	Engage technicians & administrations in NBS co-creation.	Simulations/tests of green renovation actions in a LDT.	Collect & share info on green strategies.
Athens	Detect potential areas for pocket parks, green walls & other NBS.	Analyse changes of heat island effects caused by NBS implementations.	Analyse changes of heat island effects caused by NBS implementations.

3.3.9 Scoping the pilot sites

An initial scoping of the pilot site, defining its thematic and geographic boundaries, was conducted during the "Define" step of the LLL framework. As this information was further refined in the subsequent "Understand" step, the combined results **will be presented in Chapter 3.4**.

3.4 The Understand step: analysing the context and engaging stakeholders

The Understand step aims to build a strong knowledge base and stakeholder network, which will serve as the foundation for the co-creation of NBS. Key actions include:

- Stakeholder mapping and engagement, identifying relevant actors across the quadruple helix (public sector, private sector, academia, and civil society) and ensuring their active involvement.
- Local context analysis, including socio-environmental, governance, and policy dimensions relevant to the pilot area.
- Development of a participatory plan, outlining how local actors will be engaged throughout the co-creation and implementation process.

Expected Results:

- A broad and inclusive **stakeholder network**, ready to participate in the co-creation process.
- A comprehensive **context analysis**, providing the necessary insight for informed decision-making.
- A **participatory engagement plan**, detailing **tools**, **methods**, and moments for structured involvement of local actors.

3.4.1 Stakeholder mapping

WP5 conducted a comprehensive cross-WP stakeholder mapping exercise for each URBREATH pilot city, spanning multiple exercises that began in May 2024. The final validation took place during a series of four climate zone-specific LLL workshops held in November and December 2024. Within the URBREATH project framework, stakeholder mapping serves as a critical methodological step to systematically identify, classify, and analyse key actors involved in the selection, implementation, and evaluation of NBSs.

This process facilitates an understanding of stakeholder roles, interests, and levels of influence across local governance, civil society, academia, and the private sector (i.e., the quadruple helix model). By delineating stakeholder categories and their respective degrees of engagement and impact, the mapping supports the development of targeted communication and participation strategies.

Moreover, this strategic alignment enables proactive identification of potential conflicts or synergies, enhances co-creation processes within the LLLs, and informs decision-making processes in a manner consistent with the overarching goals of the URBREATH project—namely, the effective and context-sensitive implementation of NBS across diverse urban environments.

The list below is a copy from a living document that is continuously updated and shared with all URBREATH consortium partners.

Tallinn
Local partner: Taltech

Government	**Academia**	**Industry**	**Community**
City of Tallinn Owner of Lina Hall	TalTech	Restaurant Harbour Developers Parking lot owner Street cleaning company Small businesses (arts and crafts)	Sauna users Winter swimmers Pedestrians/visitors with a focus on children/older adults Car picnickers Tourist

Kajaani **Local partner: Univ. Kajaani**	**Government**	**Academia**	**Industry**	**Community**
	City of Kajaani ELY-centre	KAMK Oulu University TalTech Environmental Research Institute of Finland	NBS consultancy companies Development companies Lumi? Watec, Sitowise, MACON	Nature Conservation Association Inhabitants associations in old and new snow melt sites Focus on school kids & students
Leuven **Local partner: VLO, VITO**	**Government**	**Academia**	**Industry**	**Community**
	Dep. public works green, participation/liveability, ICT/data, sustainability, mobility Neighbourhood workers Smart city Leuven	KU Leuven TalTech UrbanLab	Leuven 2030 UrbanSense (data platform) Soccer club Social housing company Local shops (IMEC)	Citizens - inhabitants Lower SES groups Students Community watchers Youth workers Neighbourhood police Neighbourhood centre
Aarhus **Local partner: Bloxhub**	**Government**	**Academia**	**Industry**	**Community**
	Aarhus city's offices for digitalisation, water management, urban spaces, green areas, and planning. Aarhus Futures Lab	TalTech Aarhus University Aalborg University	Restaurant and pub owners Shops owners Consultants	Commuters Local community council Citizens in general Students

Cluj-Napoca **Local partner: Urbasofia**	**Government**	**Academia**	**Industry**	**Community**
	City Municipality of Cluj Departments: European funds, Urban Strategies, Urban ecology and green spaces, public events and citizen information Civic Imagination and Innovation Centre	Technical University of Cluj (architecture & urbanism, environmental science) UBB & USAMV	TERAPIA Transylvania IT-cluster Industrial zone owners Cluj Metropolitan Area (CMA) Water company Somes SA Electric Energy Distribution Romania ENERGOBIT	Residents Cultural centre Youth federation Architect groups Scena Urbana Cycling tourism club Somes Delivery NGO SOS Cluj NGO
Pilsen **Local partner: Fraunhofer**	**Government**	**Academia**	**Industry**	**Community**
	City of Pilsen Urban Planning and Development Institute (UKRMP) Public Property Administration (SVSMP) SITMP dep. of Heritage Protection	Taltech University of West Bohemia	Pilsen-based companies/startups Local businesses (cafes, restaurants, shops) Investors	Residents Expert NGOs / citizen organisations in public space design Environmental groups

Madrid **Local partners: DML, UPM, Traza, Basurama**	**Government**	**Academia**	**Industry**	**Community**
	Madrid City Council teams: urban planning, public realm, parks & green areas, climate change & energy, Villaverde, data and digital, other departments. Local governments.	TalTech University of Madrid	NBS implementors Investors	Residents San Cristobal Community Board Public schools NGO Education, culture, solidarity Continuing Care Program Environmental groups
Athens **Local partners: Telesto**	**Government**	**Academia**	**Industry**	**Community**
	City of Athens Local governments DAEM Elliniko metro Ministry of transport & infrastructure. Ministry of Energy & Environment National Observatory of Athens OASA	TalTech National Technical University of Athens	Real estate Green technologies. Local businesses	Residents NGOs

Parma, Local partners: Polimi, Municipia	**Government**	**Academia**	**Industry**	**Community**
	City of Parma	University of Parma TalTech	Railway company	Citizens
			Companies with parking lots & other NBS plans	KMVerde Parma
				CEA Environmental Ethics center
				Art Lab

Table 3: Stakeholder mapping for all URBREATH pilots.

3.4.2 In-depth scoping of the pilot sites

This chapter offers a concise overview of the URBREATH pilot sites, outlining their thematic and geographic boundaries as established during the "Define" step of the LLL framework. It is further enriched with local contextual information—covering socio-environmental, governance, and policy dimensions relevant to each pilot area—as well as the proposed NBS plans.

3.4.2.1 Boreal climatic zone

Front-runner city Tallinn

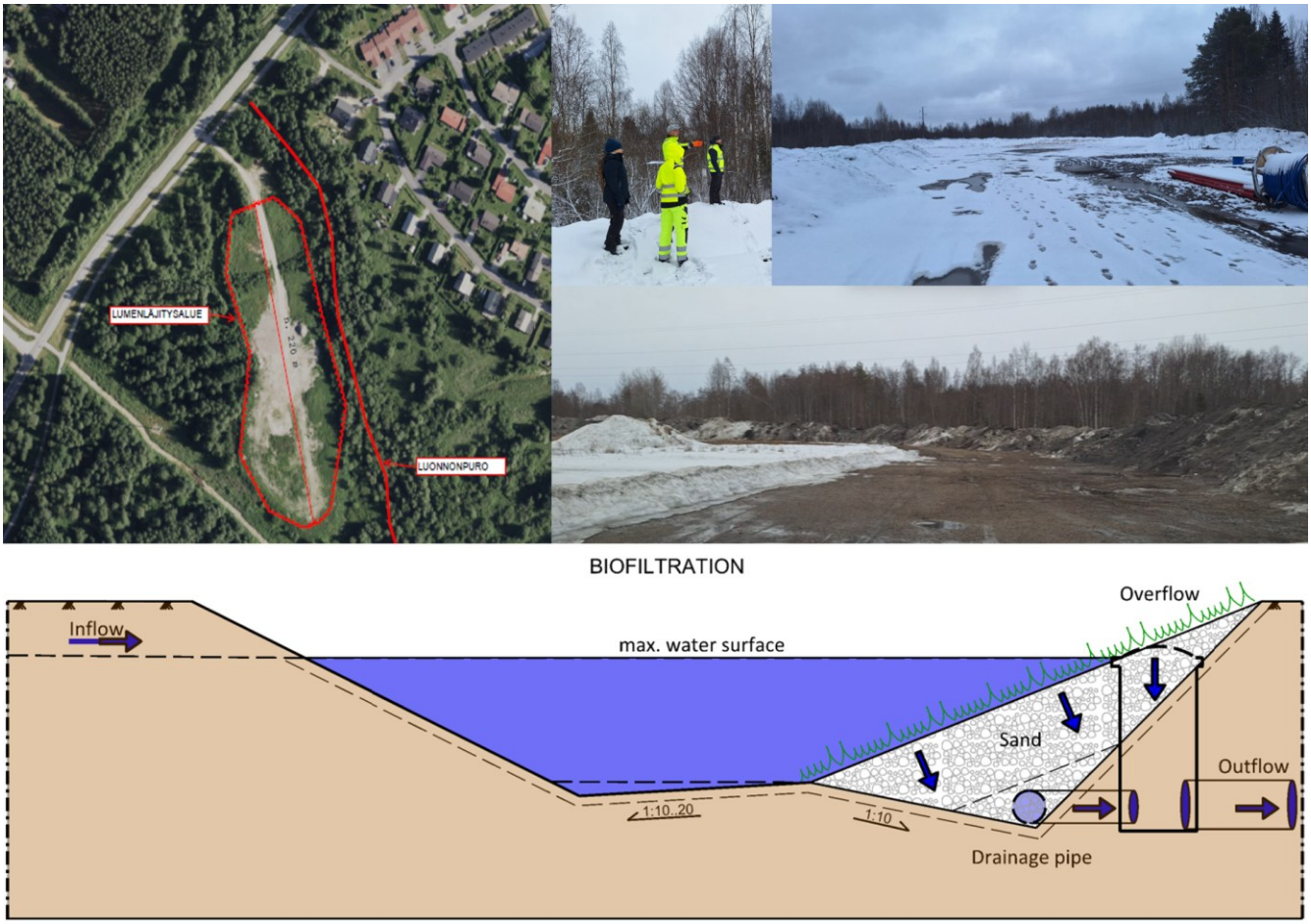
- The pilot site covers +/- 40,300 m² of city-owned land, bordered by private properties.
- The area is situated in Tallinn City Centre, close to the Tallinn harbour. It is essentially a brownfield area, being underused.
- A baseline assessment for Tallinn's Central City General Planning (2020) identified the area as poorly connected to the city centre and difficult to access. A 2024 study by the Stockholm Environment Institute further described it as perceived by citizens, tourists, and local business owners as “abandoned, confusing, and unfriendly.”
- Development activities are close by, and there is a new tramline.
- There is a seaside promenade, an unofficial beach and a community sauna by the sea, built on a citizens' initiative.
- The central building is a national monument under heritage protection – derelict and no plans for over two decades.

Figure 13: Impressions of the Tallinn pilot site.

Follower city Kajaani

- Pyykönpuro, Kajaani, Finland. The pilot site was selected through cross-sectoral cooperation.
- The pilot site is an important local snow dumping area.
- Currently discharges meltwater and litter into a natural stream that has a significant recreational value.
- The area itself, even located in the urban area, is not actively used by the citizens.
- An NBS is implemented for the management of meltwater from the snow dumping site in the Pyykönpuro area. The amount of snow to be treated is around 30,000-50.000 m^3 per season.

Figure 14: Impressions of the Kajaani pilot site.

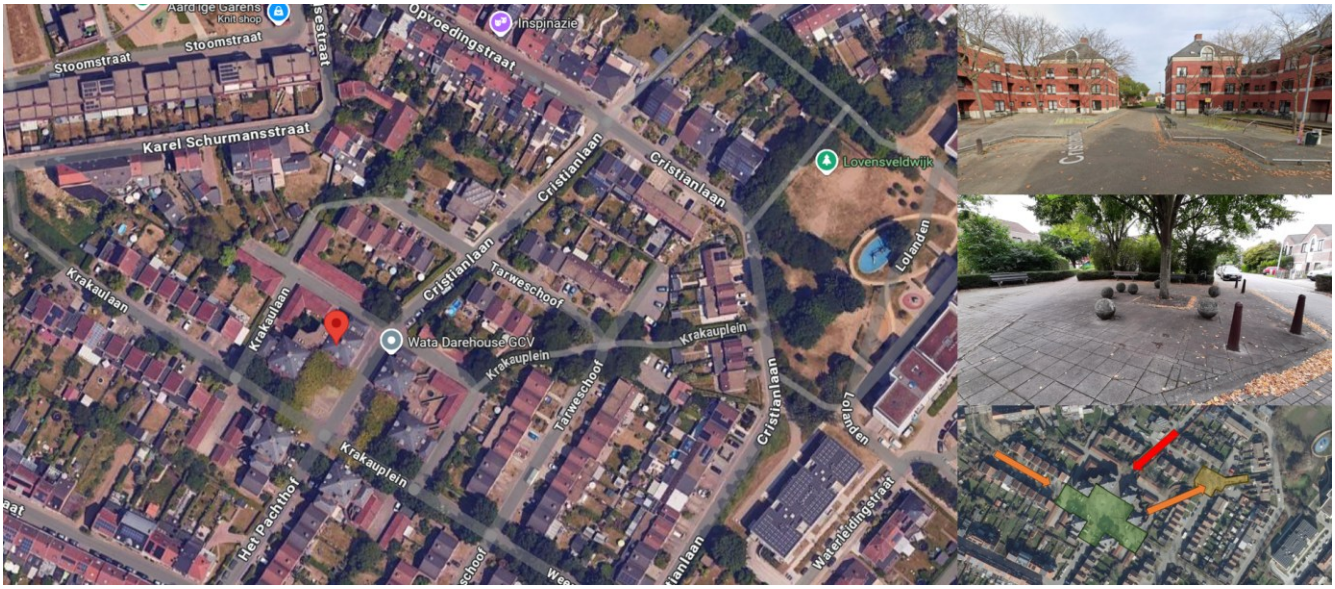


3.4.2.2 Atlantic climatic zone

Front-runner city Leuven

- Location: Leuven, Krakau square & Tarweschoof Kessel-lo.
- Residential (and social housing/low-income) area.
- Green spaces on the neighbouring sides (Hal 5, Lolanden).
- Very sealed on the square (apart from some trees, which also suffer from their limited space).
- No specific NBS design yet, focus on unsealing/depaving/water infiltration/biodiversity/access to green/… A few ideas include:
    - Rain gardens and water structures in the landscape
    - Green walls or “green tiles”
    - Capturing the rainwater from the buildings
    - Different elements of green structure – elements and climate-adaptive interventions
    - Permeable surfaces for parking lots and restructuring (broadening the areas around the trees)
    - Inclusion/exclusion of the circularity of materials

Figure 15: Impressions of the Leuven pilot site.



Follower city Aarhus

- Location: Vesterbro Torv
- Remodelling of the central square and surrounding streets for:
    - better surface water management
    - Less car traffic
    - Increased liveability for residents
- 2 types of NBS solutions are planned:

- Water management: pools at the top of the hill, rainwater beds along the streets, and water management across the square.
- Urban Greening: trees on the square and along the streets, and flowers and other plants in the rainwater beds.

Figure 16: Impressions of the Aarhus pilot site.

3.4.2.3 Mediterranean climatic zone

Front-runner city Madrid

PILOT 1 | Urban regeneration in San Cristóbal

- Located in the San Cristóbal neighbourhood, within the district of Villaverde.
- The scope of the intervention: rehabilitation of the main commercial areas in the neighbourhood. Revitalise local small businesses, regenerate associated public spaces.
- Opportunity Context: This pilot builds on a broader urban transformation process promoted by various municipal initiatives. Leverages the previous experience of the LIFE PACT project, which improved the climate and social resilience of school environments in the same neighbourhood. Current intervention allows for scaling up, connecting previous learnings with new strategies for commercial activation, urban sustainability, and public space enhancement.
- Approximate Area: 12.000 m^2 along a strategic corridor that links commercial areas with educational facilities.
- Intervention Criteria: The intervention is guided by integrated urban regeneration principles, including:
  - improving environmental quality
  - Rehabilitating public spaces
  - Strengthening local small businesses
  - Creating safe, welcoming school routes

PILOTO 2 | CEIP Antonio Nebrija (replication site)

- Located in the Villaverde Bajo area of Madrid.
- Focus on the rehabilitation of the neighbourhood's main commercial zones. Revitalise local small businesses and regenerate the pedestrian network to improve accessibility, urban quality, and economic activity.
- Opportunity Context: This intervention builds upon existing municipal strategies for commercial revitalisation and sustainable mobility. Connects with previous efforts to improve school environments and public spaces, offering an opportunity to scale up.
- Approximate Area: 10.000 m^2 around key commercial streets and public spaces in Villaverde Bajo.
- Intervention Criteria: The pilot is guided by integrated urban regeneration principles, including:
    - Enhancing the pedestrian experience
    - Supporting local commerce
    - Increasing climate resilience with nature-based solutions
    - Improving safety and accessibility around the school and public spaces

Figure 17: Impressions of the two Madrid pilot sites. Pictures at the left show the main pilot site, the plan in the middle concerns the replication site.

Follower city Athens

- Regeneration of Vasilisis Olgas Avenue.
- Surface Area: total under development area 28.360 m^2.
- Aims to create a green corridor/open public space, connecting major attractions (the temple of Olympian Zeus, Zappeion and the National Garden). It will complete the Great Archaeological Walk of Athens (from Kerameikos to the Panathenaic Stadium).
- Existing situation: Dense urban fabric, outdated design, limited green space.
- Narrow street design with high volumes of motorised traffic (cars, tourist coaches and motorcycles).
- Poor stormwater drainage.
- Limited accessibility for bicycles and pedestrians, traffic conflicts, limited accessibility and low local community engagement.
- Protecting fragile ancient ruins requires adaptive design.
- Planned NBS include:
    - Urban Greening: plant native, non-invasive species (158 trees and over 8,500 shrubs) for cooling and biodiversity integration.
    - Enhancing a city cooling corridor: reduce hard surfaces, widen open spaces.
    - Flood mitigation: installation of new stormwater pipelines and permeable surfaces.
    - Accessibility and co-creation: open, accessible public space for locals and visitors and shaded seating, enhancement of sustainable mobility (pedestrians and bicycles, public transport), no on-road parking, but access to off-road.

Figure 18: Impressions of the Athens pilot site.

Follower city Parma

- NBS solution for San Leonardo.
- Surface: 22.800 m^2.
- Stakeholders: City Council (owner), Orti di via Venezia (local association).
- Project: cohesion among different social groups (immigrants, families, students) through farmers' activities.
- NBS plans include:
    - Urban Garden located in the area of Via Venezia. This is a buffer area near the freeway, it's a social activity fundamental for socialisation with migrant populations and groups of different ages.
    - Compost sharing. Iren, the company responsible for waste collection, has already launched the initiative. Provide compost collectors to homeowners (local associations will manage pilot projects).
    - Guidelines for the new building areas on Via San Leonardo. Several brownfield sites and urban voids for new urban development. Commitment of the administration: establish new green standards.

Figure 19: Impressions of the Parma pilot site.

3.4.2.4 Continental climatic zone

Front-runner city Cluj-Napoca - 4 sites

Site 1 - Str. Alexandru Sahia

- Residential area with significant existing vegetation.
- Central vegetation strip: +/- 1.500 m^2 (excluding house front strips).

- Area allows reconfiguration to match residents' preferences.
- Type of NBS Intervention:
    - Development of green corridors (vegetation alignments along streets).
    - Planting in existing green areas and restructured streets.
    - Vegetation adapted to: heavy traffic, inadequate public spaces, underused pedestrian areas, residential–industrial landscape gap. Low-maintenance design: locally adapted grasses, shrubs, and trees.

Site 2 - Str. Nădășel-Someşul Mic

- Surface area: +/- 4,500 m^2, part of local green infrastructure.
- Unique landscape with open spaces suitable for temporary community events.
- An unnecessary fence limits access.
- Existing dirt paths to be preserved. Informal fruit trees planted by residents; the site is clean and well-maintained.
- Overhead high-voltage line present - requires low to medium vegetation nearby and strict safety protocols (no construction allowed).
- Type of NBS Intervention
    - Creation of a green corridor (mainly medium and low vegetation).
    - Development of a multifunctional ecological space featuring community gardens, an urban orchard, nature observation areas, biodiversity information panels, and temporary wooden structures for community use.

Site 3 – Str. Timișului, Str. Blajului

- Surface area: +/- 2 ha open space near the Some River, adjacent to social housing.
- Limited river connection due to fences and invasive vegetation.
- Informal citizen interventions (benches, vegetable gardens) need formalisation.
- Potential to become a multifunctional public space with ecological and recreational functions, while respecting PUG regulations and connecting to the green-blue network.
- Type of NBS Intervention:
    - Multifunctional public space combining community gardening (vegetables, fruit trees), recreation, and social spaces.
    - Supports ecological restoration, enhances ecosystem services, and integrates the riverbank into the urban landscape.

Site 4 (new addition) - Corridor on str. Bărc III

- Surface area: +/- 0.46 ha next to residential houses; gently sloped land towards the Someșul Mic River.
- Vegetation becomes denser near the river; the area has small, isolated playgrounds and no high-voltage lines.

- Residents want a safe, open community space functioning as an extension of their yards; currently used informally for walks and play.
- Type of NBS Intervention:
    - Type of NBS Intervention: creation of a community green corridor with playgrounds for all ages, temporary social and play structures, and shaded areas.
    - Possible shared street with traffic calming, natural riverbank access, and planting for microclimate improvement and green-blue corridor extension.

Figure 20: Impressions of the four pilot sites in Cluj-Napoca's Iris neighbourhood. The top image shows the overall location of the sites, which are visualised in more detail below.


2
3
4

Follower city Pilsen

- Pilsen city square.
- Located in the middle of the historical centre of Pilsen.
- The Gothic St. Bartholomew's Cathedral stands in the middle of the square.
- NBS to be implemented:
    - Elm tree + Japanese pagoda tree
    - Trees will be planted in lines related to the grid of the square, but with respect to existing utilities.
    - Significant planting in the southern part by the former public toilets - creating an area for relaxation and refreshment.
    - Trees do not prevent views of St Bartholomew's Cathedral.

Figure 21: Impressions of the Pilsen pilot site.

3.4.3 Workshop - sharpening pilot cities' Local Living Lab vision and knowledge exchange

The third day of the URBREATH General Assembly, held in Madrid in October 2024, was dedicated to consolidating and critically evaluating the outcomes of previous LLL activities and to strategically aligning the forthcoming phases of implementation.

This milestone event integrated reflections on earlier participatory processes with forward-looking planning to facilitate the operationalisation of the LLLs across diverse pilot contexts.

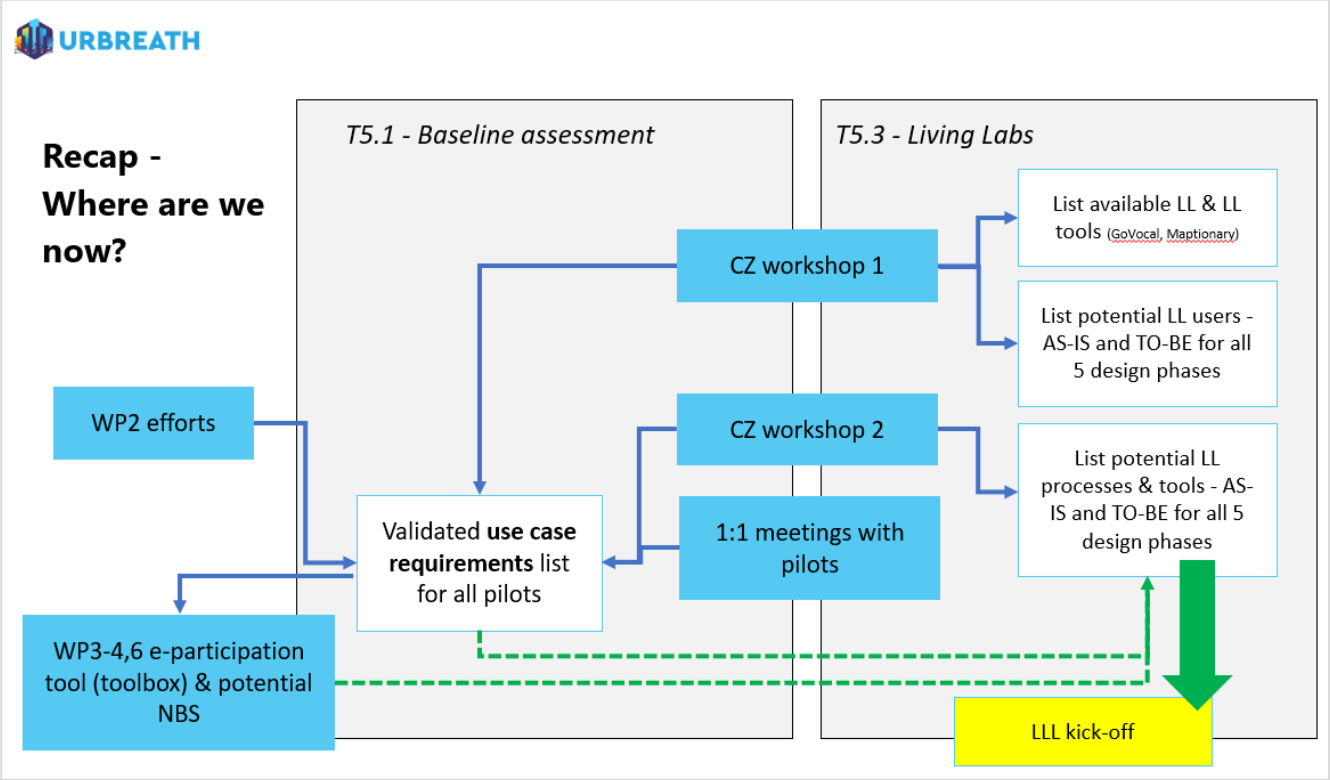
- The session commenced with a **synthesis of insights** generated through two series of creative workshops and nine in-depth bilateral sessions with individual pilot cities (as detailed in Chapters 3.3.2 and 3.3.3). These prior engagements provided a structured understanding of the current ("as-is") and envisioned ("to-be") user roles, participatory processes, and tool requirements for the LLLs throughout the various stages of the URBREATH implementation trajectory.

- A more granular overview of the **ongoing** (at that moment) **Understand step** was presented to representatives of all pilot cities. This included a detailed mapping of the interdependencies between Task 5.1 and Task 5.3, as well as the coordination with WP 3, 4, and 6 (see figure 22). Task 5.1 coordinates the functional design and technical analysis processes that lead to the development of Toolbox components, including models and tools supporting the LLLs, which is the main topic of Task 5.3.

- Insights and instructions were given in the next steps to take before the transition to the **solution phase** (**ideate and cocreate**) of the URBREATH project, and the roles of the LLL-supporting tools, such as the LDT, e-participation tool and storytelling tool.

  Conflicts between the timing of tool availability—given the development time required—and the scheduling of LLL activities—where these tools are needed for support—were discussed with the pilot cities. In addition, the activities of WP6 related to the selection, design, and evaluation of NBSs were recognised as critical to the LLLs, as clearly illustrated in the figure below.

Figure 22: Scheme illustrating the interconnections between completed LLL exercises, WP5 tasks, and the related activities under WPs 3, 4, and 6, as presented at the General Assembly in Madrid, October 2025.



Additionally, the session featured a **knowledge-sharing segment** led by the Madrid Cluster, which presented valuable lessons learned from their LLL experience. They provided an overview of the activities being implemented within their LLL, detailing both the *what* and the *how* of their local approach. The presentation offered deeper insights into their specific objectives, the process requirements necessary to achieve them, and the challenges encountered to date. Furthermore, the Madrid team outlined their planned next steps, offering inspiration and guidance for other pilot cities through their practical experience.

The session continued with a **creative workshop.**

Objectives:

Engaged pilot city representatives shared their expectations and visions for the establishment and running of LLLs, exploring potential approaches for future implementation.

The timing of this creative workshop was particularly effective, as it followed the earlier validation of use cases and technical requirements by the pilot cities during the General Assembly.

Tools and Process:

Participants were divided into four groups based on their respective climatic zones. Through a sticky note exercise, each group explored the primary objectives their cities aim to achieve through the LLLs and, importantly, the underlying motivations behind these goals. This was followed by a dynamic, moderated discussion where participants exchanged perspectives, insights, and experiences.

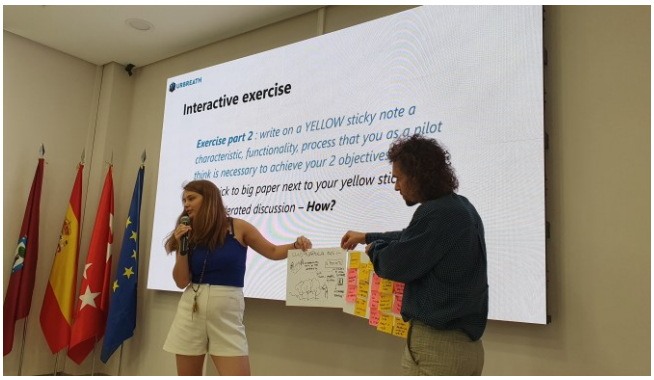
In a second collaborative exercise, the focus shifted from *why* to *how*, examining the strategies, tools, and processes needed to realise the defined goals.

Each table/group then presented their key findings and reflections to the entire URBREATH consortium, providing inspiration and peer learning opportunities for fellow pilot cities.

Results - outcome:

By the conclusion of the session, the pilot cities had taken another **meaningful step toward the operationalisation of their LLLs**, further strengthening their collective capacity to co-design, implement, and evaluate NBSs within the URBREATH project framework.

Figure 23: Series of images capturing the creative group activities during the LLL workshop, where participants—divided by climatic zone—collaboratively explored their cities' LL goals and underlying motivations, followed by a second exercise focused on strategies, tools, and processes to achieve those goals. Each group concluded by presenting their insights to the URBREATH consortium, fostering peer exchange and mutual learning.



3.4.4 Development and use of Local Living Lab supporting tools

3.4.4.1 From functional requirements list to technical ideas, concepts and designs

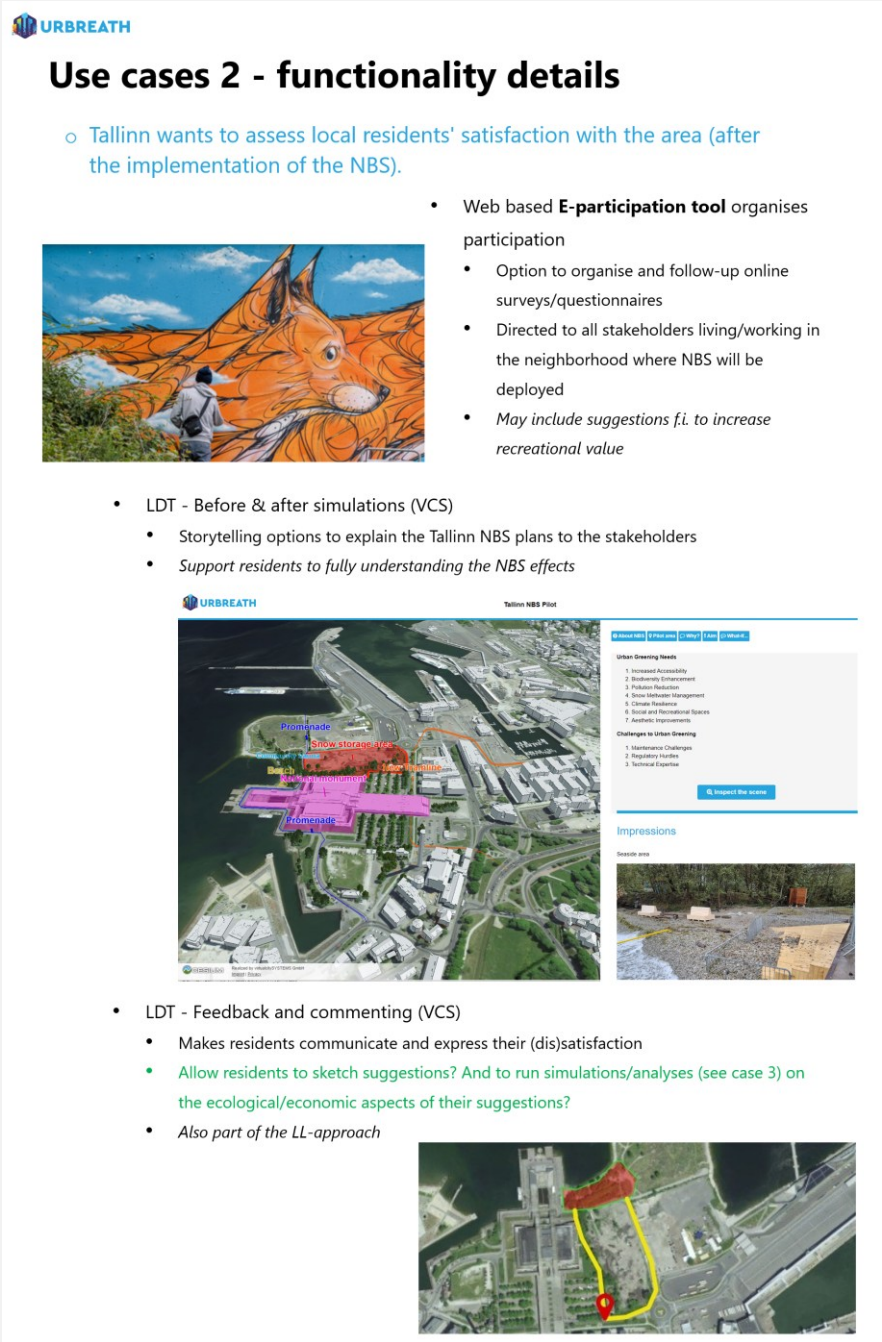
Following the "Define" phase, where functional requirements were specified in Chapter 3.3.4, the pilot cities advanced into the "Understand" phase of the LLL framework. Concerning the use of the URBREATH Toolbox, this can be translated as "the *understanding* of the technical LLL tool support options related to Task 5.3, and the initiation of the actual development of relevant tools and models".

A structured, multi-step participatory analysis was conducted in collaboration with the technical WPs 3 and 4 during late 2024. These activities formed a key part of the broader roadmap for designing, developing, and refining URBREATH tools and models, guided by Tasks 5.1 and 5.2. Because this work extended beyond the scope of Task 5.3 alone—also covering tools that support NBS planning, design and implementation—the overall pathway for tool and model development is documented in detail in Chapters 2 and 3 of Deliverable 5.1.

To illustrate the **specific approach for Task 5.3**, we highlight an example from one of several collaborative workshops held with front-runner pilot cities and URBREATH's technical partners. These workshops served as catalysts for the development phase while also marking the transition from the "Empathise" phase to the "Solution" phase in the LLL framework.

The compiled list of functional requirements served as the foundation for a structured technical analysis carried out by the technical partners, with support from Task 5.2. The figure below illustrates selected slides from a guiding presentation in which WPs 3 and 4 shared initial ideas, concepts, and design proposals. These were developed through a brainstorming process based on the functional analyses made with the pilot cities.

Figure 24: Slide compilation presenting the solution ideas, concepts, and preliminary designs developed by the URBREATH technical partners in response to the functional analysis finalised in September 2024. These slides, shown during the November 2024 workshops with the front-runner cities, focus on one of Tallinn's three prioritised use cases: the evaluation of on-site NBS by local stakeholders.



The material was presented and discussed in a series of four focused workshops held in November 2024 with the front-runner pilot cities. This example highlights the design concepts developed for one of the three prioritised use cases in the city of Tallinn. A similar in-depth approach was taken for all three prioritised use cases in each of the front-runner cities.

3.4.4.2 Developing tools to support Local Living Labs

To support the LLLs, specific attention has also been given to the development of enabling tools and models, linking the process to Task 5.3. Key tools currently in focus for LLL support include:

- The **Decidim e-participation platform** serves as a versatile digital environment for idea-sharing, stakeholder engagement, interactive dialogue, and participatory monitoring (e.g., through online surveys and discussion forums).
- The **LDT**, developed as a visual and data-driven interface to inform and involve stakeholders in the planning and implementation of NBSs.
- The **Storytelling Tool**, which integrates LDT visualisations within a narrative storyboard to present the pilot site's NBS plans in a clear, accessible, and neutral format, providing contextualised and linked information to all relevant stakeholders.

The status, implementation roadmap, and timeline for the development of these tools were shared and iteratively discussed with the pilot cities during multiple workshops and exercises, as described in **Chapter 3.3** of this Deliverable.

An initial attempt to map these tools to the specific needs of each pilot city's LLL was conducted in late 2024. However, due to the incomplete visibility on the full Toolbox and tool availability by Month 18, this exercise proved premature. As a result, a more comprehensive and systematic mapping process was scheduled for the first half of 2025, when tool specifications and deployment scenarios would be more clearly defined.

3.4.4.3 Testing and using available Local Living Lab supporting tools

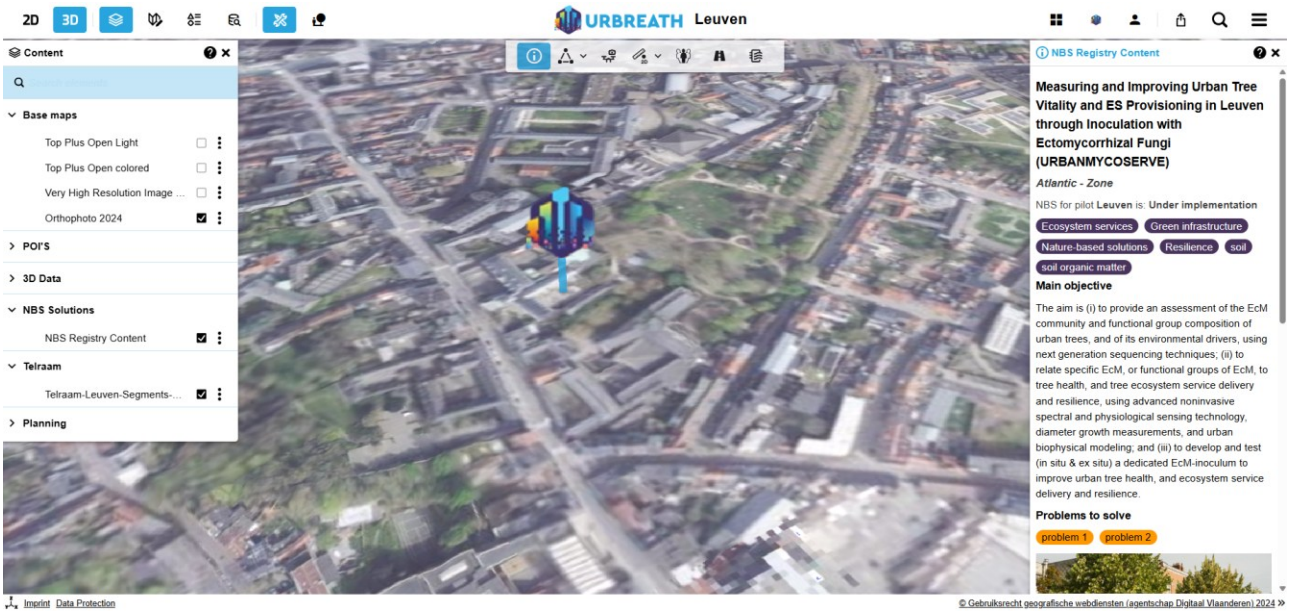
A first set of tools became available by the end of 2024. The LDT and storytelling tools were demonstrated during the four climate zone-specific LLL workshops held in December 2024. These sessions introduced the tools' functionalities and illustrated their intended use within the Local Living Lab context.

Figure 25: Screen capture of the LDT for the pilot NBS site in Tallinn, showcasing its status at the end of 2024, including integrated orthophotos, Level of Detail 2 (LOD-2) building models, and tree data.

Figure 26: Screen capture of the LDT for the pilot NBS site in Pilsen, showcasing its status at the end of 2024, including integrated orthophotos, LOD-2 building models, and tree data.

During the first half of 2025, the customisation of both the LDT and storytelling tools continued under the guidance of VCS. This phase included a series of instructive webinars to guide users through the various functionalities of both tools. In parallel, new LDT features were developed and regularly demonstrated to pilot cities. A more detailed overview of the available functionalities is provided in Chapter 5.2.2 of Deliverable 5.1, as these activities fall under the scope of Task 5.4.

Figure 27: Screen capture of the customised storytelling tool for the city of Leuven, as available in April 2025. The tool integrates orthophotos, LOD-2 buildings, trees, traffic data, and NBS plans. Project narratives were authored by the city of Leuven.



During the General Assembly in Cluj-Napoca on May 21st, 2025, pilot cities were introduced to tools and model simulations—many still under development—created by Work Packages 3 and 4. These tools were showcased in a dedicated demo café. Throughout June 2025, additional demonstrations were held during the monthly pilot city calls coordinated by Task 5.2 (WP5), providing updates on newly implemented functionalities.

However, most tools and model simulations only became available toward the end of Month 18, which also marks the conclusion of the current reporting period. Therefore, further details on the newly developed LLL-supporting tools, their testing, and customisation will be provided in the next Deliverable.

These LLL-supporting tools will play a central role in the upcoming "Solution" phase of the URBREATH project, within both the “Ideate” and “Co-create” steps of the Living Lab methodology.

3.4.5 Mapping pilot city progress across project phases

During the exercises and workshops outlined in Chapter 3.3, a step-by-step approach was used to explore and document the participation frameworks of the pilot cities. As an initial activity, each pilot city was invited to place itself on a project timeline to indicate its current phase within the URBREATH project (as of November/December 2024).

This exercise revealed an apparent **variation** in the progression of pilot cities, with different cities situated in distinct phases of the project. This diversity in status serves as a valuable input for WP5, highlighting the need for a flexible and tailored support strategy. Moving forward, WP5 will ensure that its guidance, tools, and consultations are aligned with the varying needs of the pilots, addressing each phase of the project lifecycle to support inclusive and effective implementation of LLLs.

Table 4: Mapping of the actual phase of the URBREATH project for each pilot city, done in November and the beginning of December 2025.

	Empathise phase (Inception)		**Solution phase (Piloting)**		**Deployment phase (Transition)**	
	Define	Understand	Ideate (Jan. 2025)	Co-create	Implement	Evaluate
Tallinn			Beginning ideate			
Kajaani			End ideate			
Leuven			First steps ideate			
Aarhus		Beginning understand		Beginning cocreate		
Cluj-Napoca		Middle understand				
Pilsen				Middle cocreate		
Madrid		Between understand and ideate				
Parma		Middle understand				
Athens		Beginning understand				

3.4.6 Investigating participation ambitions in the Local Living Labs

We investigated the ambition levels of all pilot cities regarding stakeholder participation within their LLLs. The aim was to assess how each city intends to engage local stakeholders throughout the planning, design and implementation of NBS.

To guide this analysis, we applied a **five-level participation framework**, which reflects increasing degrees of stakeholder involvement and influence over decision-making processes.

1. **Inform**

   Goal: Provide the public with clear, balanced, and objective information to help them understand problems, options, and potential solutions.

   Promise to stakeholders: We will keep you informed.

2. **Consult**

   Goal: Obtain public feedback on analysis, alternatives, or decisions.

   Promise to stakeholders: We will keep you informed, listen to your concerns and aspirations, and explain how input influenced decisions.

3. **Involve**

   Goal: Work directly with the public throughout the process to ensure their concerns and aspirations are understood and considered.

   Promise to stakeholders: We will work with you to reflect your concerns and provide feedback on how your input shaped decisions.

4. **Collaborate**

   Goal: Partner with the public in each aspect of decision-making, including developing alternatives and identifying preferred solutions.

   Promise to stakeholders: We will look to you for advice and incorporate your recommendations into decisions wherever possible.

5. **Empower**

   Goal: Place final decision-making authority in the hands of the public.

   Promise to stakeholders: We will implement what you decide.

This framework enabled us to better understand each pilot city's intended approach to participation and to support them in aligning their ambitions with the principles of co-creation and local ownership that are central to the URBREATH project.

As a result of this exercise, different ambition levels were identified for the URBREATH pilot cities.

Table 5: Mapped participatory ambition levels for all URBREATH pilot cities (dark magenta), with the potential range of variation as perceived by the cities shown in light magenta.

	Inform	Consult	Involve	Collaborate	Empower
Tallinn				Ambition	
Kajaani	Ambition phase 1			Ambition phase 2	
Leuven				Ambition	
Aarhus		Ambition			
Cluj-Napoca				Ambition	
Pilsen		Ambition			
Madrid				Ambition	
Parma					Ambition
Athens			Ambition		

3.4.7 Applied workshops concluding the empathise phase

WP5 organised four workshops in November and December 2024 to conclude the Empathise phase and initiate the Solution phase of the URBREATH project. These two-hour sessions provided a comprehensive overview of the work carried out during the first year of URBREATH, explicitly focusing on the outcomes of the Define and Understand steps.

Objectives

The workshop aimed to **consolidate and refresh** the shared understanding of the Living Lab concept within the URBREATH project and to align all pilot cities on the **implementation framework and planning**. It provided a platform to re-examine why the Living Lab approach is central to the project, **what it entails and what it does not**, and to highlight the core characteristics that make a Living Lab function effectively in practice. The workshop also draws attention to **common pitfalls to avoid** for a successful process.

A key objective was to present the **final version of the Living Lab framework** for NBSs, developed through Tasks 5.3 and 2.1, and to align this with the planning timeline for each pilot city. In addition, the workshop clarified the roles and responsibilities of cities, their local implementation partners, and the URBREATH consortium.

As a **conclusion to the Empathise phase**, the workshop confirmed the internal organisational roles, the involved external stakeholders, and the level of ambition for participatory engagement. Finally, the workshop included activities marking the conclusion of the Understand phase, such as assessing pilot cities' ambitions on the participation scale and mapping the expected focus of participation throughout the various stages of the project.

Tools and Process

The workshop was designed as a participatory and iterative learning experience through blending presentations, guided discussions, and creative exercises delivered with a shared PowerPoint presentation accessible to all pilot city representatives. It began with a framing presentation that revisited the theoretical and practical foundations of the Living Lab methodology, followed by the introduction of the final URBREATH Living Lab framework.

In the subsequent interactive sessions, each pilot city aligned its local planning with the overall project timeline through moderated exchanges. Additionally, cities mapped their intended use of LL tools onto the broader project schedule. The collaborative mapping of stakeholder engagement across each project phase enabled the translation of strategic ambitions into concrete, operational actions.

Results - outcome

The findings from this workshop, in conjunction with the results obtained from all other workshops detailed in chapter 3.3, are presented and analysed in both chapters 3.3 and 3.4.

4. Entering the solution phase

4.1 Ideate and co-create steps

In the **ideate** and **co-create** parts of the URBREATH project, pilot cities actively engage in structured co-creative processes aimed at generating, testing, and refining NBSs for their local contexts. These phases build upon the foundational work established during the empathise phase and translate the identified challenges, stakeholder needs, and contextual factors into tangible design inputs and collaborative solutions.

4.1.1 Ideate phase

During the **ideate phase**, pilot cities:

- Organise interactive workshops and brainstorming sessions within their Local Living Labs to **generate innovative ideas** for potential NBS interventions.
- **Explore dilemmas** and trade-offs that may arise when implementing NBS in complex urban environments, including social, spatial, and technical constraints.
- **Involve a wide range of stakeholders**—including citizens, urban planners, environmental experts, and public authorities—to ensure diversity in perspectives and encourage creative, yet context-sensitive, solutions.
- Use design tools and visualisation techniques (such as stakeholder maps, journey maps, and mock-ups) to **structure thinking and stimulate dialogue**.
- Begin to **prioritise feasible ideas** and set a shared direction for the following co-creation process.

4.1.2 Co-Create Phase

In the **co-create phase**, the ideas generated earlier are collaboratively shaped into implementable concepts through multi-stakeholder collaboration:

- Pilot cities conduct **co-design workshops**, where all relevant actors work together to **translate ideas into concrete NBS designs**, reflecting local needs and ambitions.
- The focus is on producing **multi-stakeholder designs** that integrate ecological, technical, and social dimensions.
- These design outcomes are used to develop **input for procurement**, ensuring that solutions are technically sound and align with public procurement standards.
- Where possible, **digital tools and local digital twins** developed by the project are tested and applied in the LLLs to support design discussions, simulations, and participatory decision-making.

- This phase lays the groundwork for implementation by fostering ownership and ensuring the proposed solutions are **co-developed and validated** by the community and local stakeholders.

Together, the ideate and co-create phases mark the **transition from exploration to action**, providing cities with concrete, participatory, and context-aware NBS designs that are ready for implementation and evaluation in the final deployment phase.

4.1.3 How WP5 supports these steps

The ideate and co-create components of the URBREATH project were developed under the supervision and guidance of Work Package 5 (WP5), which provided structured support through the following activities:

- **Train-the-trainer sessions**: Two sessions were organised to equip local teams with the knowledge and skills to effectively facilitate LLL processes.
- **Monthly online dedicated city calls**: Regular virtual meetings are held to maintain momentum, ensure alignment across pilot cities, and offer ongoing guidance.
- **Direct support to individual pilot cities**: WP5 maintained continuous contact with local teams to offer tailored advice and respond to specific needs.

4.2 Training sessions to support Local Living Lab implementation

In the first half of 2025, a series of train-the-trainer sessions were organised to inspire and guide pilot cities in the setup and operation of their LLLs. These sessions were specifically designed to support the **ideate** and **co-create** phases of the general LLL framework.

Through the presentation of insights, best practice examples and a comprehensive set of practical guidelines and methodologies, WP5 aimed to empower key actors in the pilot cities, including **Living Lab Managers**, **Stakeholder Managers**, and **Pilot Managers**, in developing effective, locally tailored LLL approaches.

4.2.1 Train-the-trainer session

On February 7th, 2025, a train-the-trainer was set up with all URBREATH pilot cities.

The interactive session started with a short recap of the actual project phase we are in (the solution phase started at the beginning of this 2025), in reference to the LLL framework timeline. Also, a short, reminding overview was given on the pilot cities' responsibilities as explained in earlier workshops at the end of 2024.

City pilots are responsible for managing the LLL operation and coordination, while **stakeholder managers** specifically focus on fostering stakeholder participation and ensuring their inputs are effectively captured and integrated into the solution design process. Together, they drive the successful co-creation of implementable, community-supported Nature-Based Solutions.

After, the interactive part of the session started. We started with a warm-up exercise, stimulating reflective thinking and debating of some LLL-related statements.

- By summing up some pro and contra statements concerning co-creation and participation, triggering a debate on the relevance of the LLL work.
- We proceeded by highlighting the value of multi-stakeholder ideation and co-creation, which is essential for the URBREATH pilots as it ensures that solutions are developed in collaboration with local communities and ecosystems, rather than being imposed upon them. This approach fosters awareness, mutual learning, and trust among participants, creating a sense of shared ownership. It also helps pilots overcome cognitive biases by bringing in diverse perspectives, which can spark innovative and unexpected ideas. Ultimately, it leads to more effective, locally adapted solutions that are better suited to the real needs and contexts of the pilot areas
- More food for thought is a popular theory. It extends the current quadruple helix model with the **natural environment**, creating a quintuple helix, hereby recognising the crucial role of ecology and sustainability in NBS projects. Environmental challenges can also catalyse new knowledge and innovations, leading to a more sustainable future. Also, the importance of involving ALL stakeholders was stressed.

As a second part of the session, different features of the Ideate step of the solution phase were highlighted.

- Insights were given on the fact that specific problems should be tackled during this phase while formulating fresh new ideas with the committed stakeholders. The upcoming co-create step focuses on specific solutions by creating multi-stakeholder designs.
- "Ideation is the creative process of **generating, developing, and communicating new ideas**, where an idea is understood as a basic unit of thought that can be **either visual, concrete, or abstract**" as quoted by Max Beijneveld.
- We presented the **objectives of the Ideate step** in the URBREATH project. This step aims to kickstart the creative process by introducing the overall scope, familiarising stakeholders with the site, its challenges, and the project goals. It encourages out-of-the-box thinking, brings together diverse perspectives, and focuses on generating a wide range of ideas to address the identified issues collaboratively.

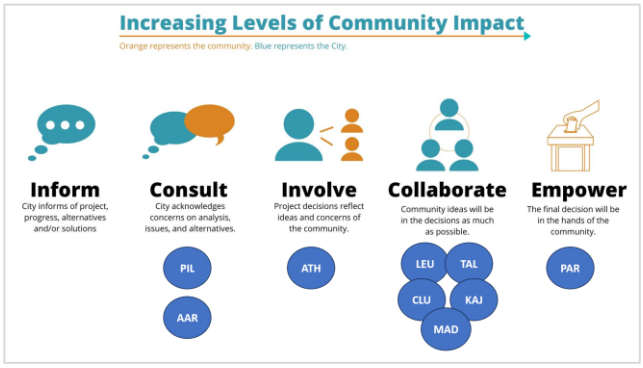
Some interesting techniques were explained to the pilot cities:

- The **use of problem statements,** in the style of "how might we ... ?", is an excellent technique in the ideate step. These three little words set LLL participants in a direction that is solution-oriented (How), optimistic (Might), and collaborative (We).

  As a demonstration, a Mentimeter exercise was done with the workshop participants, challenging them to write as many problem statements as possible for their pilot use case. It is an exercise that can be easily integrated into a LLL environment.

- The concept of **body storming**. Bodystorming is an ideation technique where participants physically act out scenarios to better understand user needs and generate ideas. By "thinking with the body," this approach encourages embodied experience and deeper empathy, moving beyond traditional discussion-based brainstorming. For example, when designing NBSs, LLL participants might simulate sitting, resting, or interacting in a park setting to identify comfort, accessibility, and social interaction needs.
- The use of interactive mood boards for mind mapping ideas and obstacles.

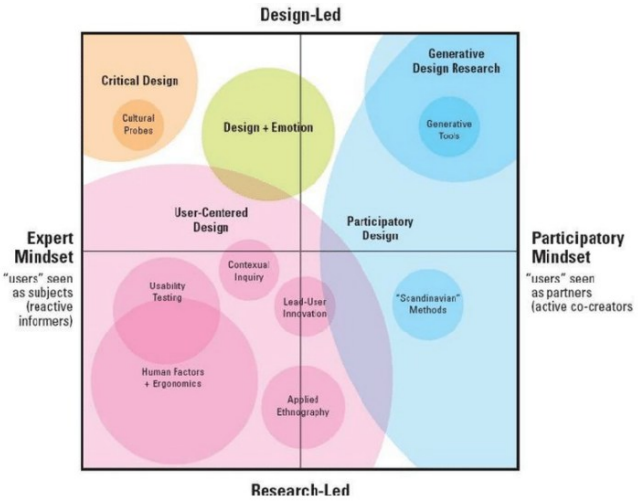
Figure 28: Presentation slides showing an example of a co-creative mind mapping and a summary of the URBREATH pilot cities' LLL-engagement levels.



The third part of the session focused on the **co-creation step** of the project's solution phase, where finding solutions using multi-stakeholder designs is key.

- "Co-creation refers to the collaborative approach of creative problem solving between diverse stakeholders through all the stages of the project" as quoted by Max Beijneveld.
- Takeaway for all URBREATH pilot cities LLL managers: for a successful co-creation step, it's important to refine the focus by **selecting and voting on the best ideas**, critically **evaluate and improve** those ideas, and—if possible—**visualise them** using tools like the LDT developed by our technical partners to better understand their potential impact.
- An open debate about techniques to enable the transition from an expert to a participatory mindset.

Figure 29: Mapping LLL actions and designs into a quadrant with two scales. A scale from expert mindset towards participatory mindset on the x-axis, a scale from "research-led" towards "design-led" actions and designs on the y-axis.



Pilot cities' Living Lab managers share their best practices through a Mentimeter exercise.

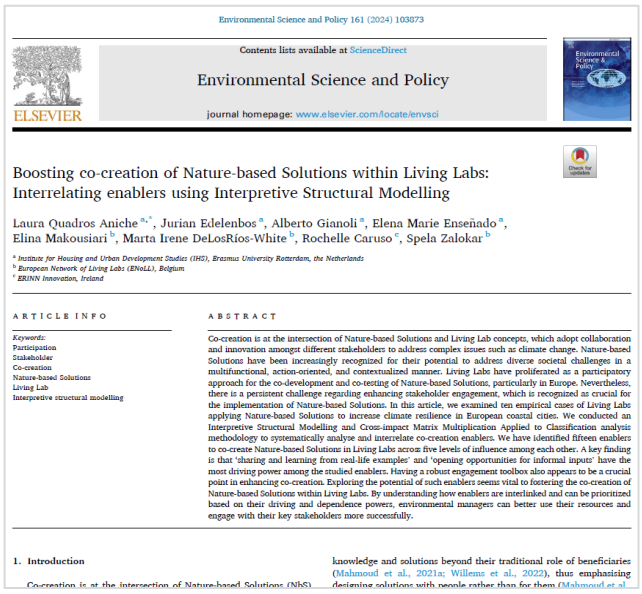
After this exercise, the findings were mapped on the prefabricated overview with common techniques to stimulate this transition.

A caveat, supported by examples, was made that strict expert mindsets and participatory mindsets may not always result in good NBS designs. And also, digital participatory mindsets can be thought of (for instance, AI-generated solutions).

- We explained a technique on how to involve citizens in designing. The **citizen design approach** in a **process lab** involves five key steps: first, identifying a value that matters to you or your community; second, selecting a specific question to address; third, choosing design tactics to explore solutions; fourth, documenting the design process; and finally, positioning your design within a shared framework or board to reflect its place in the broader context. This method supports creative, values-driven, and collaborative problem-solving.
- An approach was shared on how to explore dilemmas by asking the right questions. Another Mentimeter exercise was started, where ideas could be shared on how pilot cities would explore dilemmas. The resulting word cloud was discussed with all participants.

Finally, we presented a list with 15 co-creation LLL-enablers based on scientific research on ten cases of Living Labs applying NBSs.

Figure 30: presenting LLL co-creation enablers to the URBREATH pilot cities during a train-the-trainer session, February 2025.



Environmental Science and Policy 161 (2024) 103873

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Boosting co-creation of Nature-based Solutions within Living Labs: Interrelating enablers using Interpretive Structural Modelling

Laura Quadros Aniche [a,*], Jurian Edelenbos [a], Alberto Gianoli [a], Elena Marie Enseñado [a], Elina Makousiari [b], Marta Irene DeLosRíos-White [b], Rochelle Caruso [c], Spela Zalokar [b]

[a] Institute for Housing and Urban Development Studies (IHS), Erasmus University Rotterdam, the Netherlands
[b] European Network of Living Labs (ENoLL), Belgium
[c] ERINN Innovation, Ireland

ARTICLE INFO

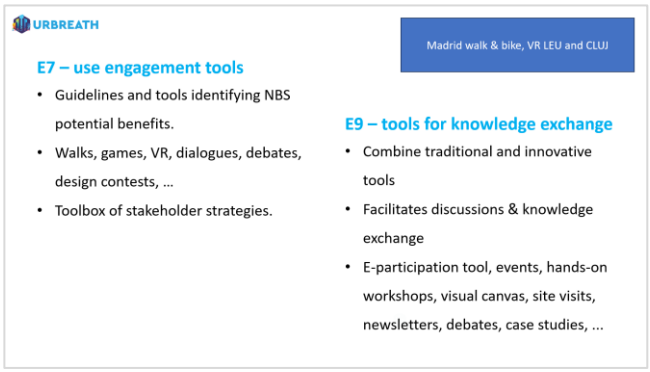
Keywords:
Participation
Stakeholder
Co-creation
Nature-based Solutions
Living Lab
Interpretive structural modelling

ABSTRACT

Co-creation is at the intersection of Nature-based Solutions and Living Lab concepts, which adopt collaboration and innovation amongst different stakeholders to address complex issues such as climate change. Nature-based Solutions have been increasingly recognized for their potential to address diverse societal challenges in a multifunctional, action-oriented, and contextualized manner. Living Labs have proliferated as a participatory approach for the co-development and co-testing of Nature-based Solutions, particularly in Europe. Nevertheless, there is a persistent challenge regarding enhancing stakeholder engagement, which is recognized as crucial for the implementation of Nature-based Solutions. In this article, we examined ten empirical cases of Living Labs applying Nature-based Solutions to increase climate resilience in European coastal cities. We conducted an Interpretive Structural Modelling and Cross-impact Matrix Multiplication Applied to Classification analysis methodology to systematically analyse and interrelate co-creation enablers. We have identified fifteen enablers to co-create Nature-based Solutions in Living Labs across five levels of influence among each other. A key finding is that 'sharing and learning from real-life examples' and 'opening opportunities for informal inputs' have the most driving power among the studied enablers. Having a robust engagement toolbox also appears to be a crucial point in enhancing co-creation. Exploring the potential of such enablers seems vital to fostering the co-creation of Nature-based Solutions within Living Labs. By understanding how enablers are interlinked and can be prioritized based on their driving and dependence powers, environmental managers can better use their resources and engage with their key stakeholders more successfully.

1. Introduction

knowledge and solutions beyond their traditional role of beneficiaries (Mahmoud et al., 2021a; Willems et al., 2022), thus emphasising



4.2.2 Exploring new opportunities for Local Living Lab support through digital tools

With the availability of **new models and tools** in May and June 2025, new opportunities have emerged to enhance the functionality and impact of LLLs across the URBREATH pilot cities. These opportunities were showcased in a 90-minute hands-on workshop held during the General Assembly in Cluj-Napoca (mid-May 2025), bringing together representatives from all pilot cities. Participants enthusiastically stepped into the role of LLL stakeholders, applying the tools and techniques to their own contexts.

It was particularly encouraging to see the pilot city representatives actively applying methods introduced during the train-the-trainer session held in February 2024. This demonstrated not only the effectiveness of the training but also the growing confidence and capacity of pilot cities in facilitating meaningful co-creation processes.

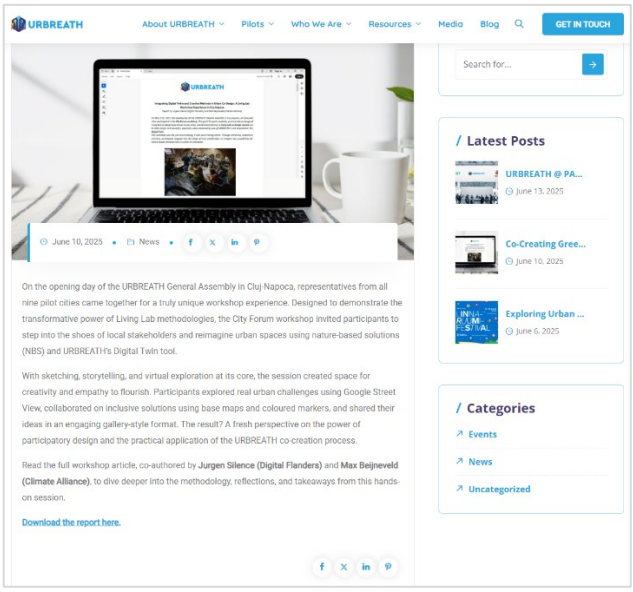
The workshop introduced several innovative and engaging techniques to support co-creation within LLLs:

- **Google Street View** was used to simulate a live site visit, enabling participants to explore the pilot areas virtually.
- **Drawing and sketching** were introduced as creative communication tools to enrich dialogue and clarify complex ideas.
- **LDT planning tools** were simulated using printed base maps, allowing participants to collaboratively design scenarios with markers and pencils, offering a tangible, interactive approach to urban design.

This Living Lab exercise was documented in detail in an article by Jurgen Silence and Max Beijneveld, titled "Integrating Digital Twins and Creative Methods in Urban Co-Design: A Living Lab Workshop Experience in Cluj-Napoca." The article reflects on the methodology, outcomes, and key insights from the workshop, serving as a practical guide for other cities that wish to replicate the approach in their own Living Labs.

The article is published on the official URBREATH website, urbreath.eu, as a downloadable PDF, providing open access to all pilot cities and interested stakeholders.

Figure 31: Screen capture of the publication on the co-creative City Forum workshop approach in Cluj-Napoca, May 2025, on the URBREATH website.



Integrating Digital Twins and Creative Methods in Urban Co-Design: A Living Lab Workshop Experience in Cluj-Napoca

Report by Jurgen Silence (Digital Flanders) and Max Beijneveld (Climate Alliance)

*On May 21st, 2025, the opening day of the URBREATH General Assembly (GA) in Cluj-Napoca, all nine pilot cities participated in the **City Forum workshop**. The goal? To spark creativity, promote the exchange of Living Lab co-design experiences across cities, and demonstrate how a **Living Lab co-design session** can be both playful and powerful, especially when enhanced by one of URBREATH's core innovations: the **Digital Twin**.*

This workshop was not just about talking; it was about taking action. Through immersive, interactive activities, participants stepped into the shoes of local stakeholders to imagine new possibilities for nature-based solutions (NBS) in urban environments.

Figure 32: Picture of four groups of pilot cities co-creating at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.

Advancing the Living Lab process: from empathy to co-creation

This session built upon the outcomes of the autumn 2024 Living Lab workshops, which concluded the Empathise step of URBREATH's Living Lab methodology. With a guided **train-the-trainer session** at the beginning of 2024, hands-on methods and guidelines were provided to the pilot cities to initiate the **Solution step**. Pilot cities deployed **ideation** and **co-creation** initiatives locally with their involved and committed stakeholders to end up with diverse stakeholders collaborating to work toward integrated NBS designs. Not every city is at the same point in implementing NBS. Still, this session highlighted the collective value of their Living Lab experiences, and the enthusiasm for learning from one another was unmistakable.

Methodological framing: drawing and role-play as creative catalysts

The workshop adopted a **Living Lab methodology** enriched with participatory design tools. A central innovation was the use of **drawing as a medium for creative expression**, critical reflection, and visual ideation. Participants were divided into four working groups, each focused on a randomly selected pilot city. To ensure impartiality and simulate the perspective of a first-time stakeholder, no participant was assigned to the table representing their city. Each group received: simplified **Digital Twin base map** printouts of the

selected urban area (1), blank sheets, sticky notes, masking tape, and an assortment of coloured pencils and markers (2) and a trained facilitator to guide the activities and discussions (3).

This hands-on, immersive approach encouraged participants to temporarily adopt the mindset of unfamiliar stakeholders, replicating the ambiguity and discovery typical of early Living Lab engagements.

Warm-up: building creative confidence

To break the ice and foster a creative mindset, participants were first asked to **draw their favourite plant or tree**, an exercise moderated by *Max Beijneveld*. From tiny succulents to mighty baobabs, participants shared botanical favourites and personal stories, showing just how diverse and imaginative our URBREATH community is. Beyond its light-hearted nature, this activity served as a metaphor for the diversity of stakeholder profiles and values encountered in urban planning. The openness and humour in participants' responses created an atmosphere of trust and creative freedom.

Figure 33: Picture of a mixed group of pilot cities members working on the Tallinn pilot area case at the Cities forum co-creative workshop using URBREATH tools and manual drawing, GA Cluj-Napoca 2025.

Round one: Diagnosing urban challenges through virtual exploration

In the first main exercise, participants used **Google Street View** on their smartphones to virtually explore the preselected neighbourhood (mimicking a preferred live site-visit walk), assessing physical conditions, perceived challenges, spatial barriers, and social dynamics. They were asked to intuitively capture, through

sketches, **what they felt and saw**, identifying needs, tensions, missed opportunities or design deficiencies in the public realm. The energy in the room grew as drawings were shared and discussed, allowing for a rich exchange of diverse perspectives, mirroring the diversity of unique stakeholder perspectives in real-world Living Labs.

Figure 34: Picture of a mixed group of pilot cities members working on the Leuven pilot area case at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.

Round two: Proposing solutions using the Digital Twin frameworks

Building on their initial impressions, participants engaged in a second round of drawing, this time directly on the Digital Twin base maps. They proposed **NBS interventions** and design solutions, using coloured markers to visually simulate different scenarios, echoing the functionalities available in the existing URBREATH Digital Twin planning tool, which was previously introduced in webinars by their technical partner, VCS.

Facilitators encouraged participants to reflect on their positionality: How would a person with a disability navigate this space? What concerns might a local business owner or a young child have? This reflexive questioning enriched the co-creation process, leading to the refinement or combination of ideas. Some initial proposals were even discarded as the groups reached more inclusive and feasible design outcomes; a compelling demonstration of **iterative, multi-stakeholder learning in action**.

Figure 35: Picture of a mixed group of pilot cities members working on the Pilsen pilot area case at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.

Figure 36: Picture of a mixed group of pilot cities members working on the Madrid pilot area case at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.

Synthesis and reflection

All group outputs were displayed in a gallery-style format, and each group proudly presented their designs, explaining the rationale behind their proposals and insights. Importantly, representatives from the pilot cities corresponding to each use case provided additional reflections:

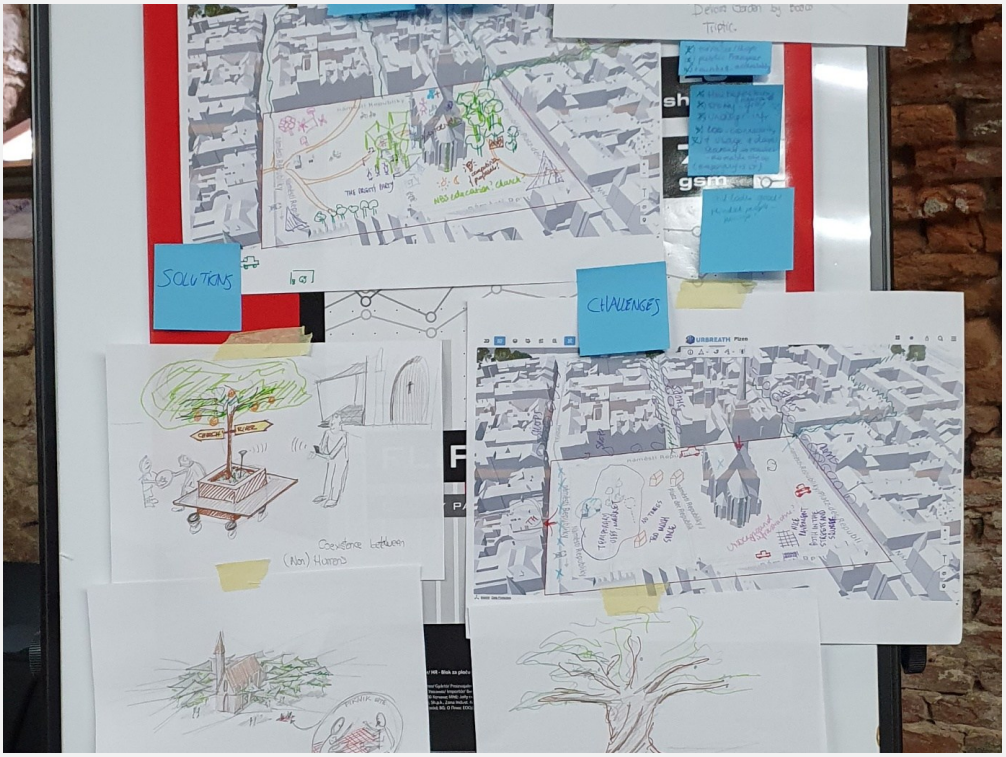
- How did the visual exploration alter the participants' understanding of the site?
- Did outsider perspectives offer unexpected insights to the city representatives?
- How did the specific urban context influence the designs?
- How did the workshop findings match with earlier co-creation initiatives with local stakeholders?

These reflections confirmed the value of combining **visual exploration, analogue creativity, and digital mapping** as mutually reinforcing components of participatory planning.

Figure 37: Picture of pilot cities presenting their co-creation results at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.

Figure 38: Picture of pilot cities presenting their co-creation results at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.

Figure 39: Picture of co-creation output drawings, created by members working on the Pilsen pilot area case at the Cities forum co-creative workshop using URBREATH tools, GA Cluj-Napoca 2025.



Conclusion and key takeaways

This workshop highlights that seeing better leads to **thinking broader and designing smarter**. By combining **Google Street View** as a virtual field visit tool with drawing techniques and Digital Twin frameworks, participants were able to co-create insightful, inclusive, and feasible NBS design concepts.
This method successfully demonstrated how Living Lab principles can be operationalised in practice and provides a **replicable and scalable approach** for other cities seeking to engage diverse stakeholders in co-creation processes. We warmly encourage broader adoption of this integrated approach as part of the growing URBREATH toolkit for urban transformation.

4.3 Fostering mutual learning and knowledge exchange

4.3.1 Bi-weekly alternating project management and cities calls 2.0

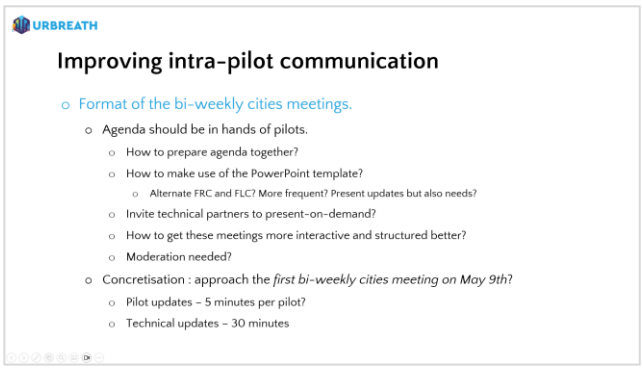
In **March 2025**, a general template was developed to help pilot cities document and share the progress of their respective cases. Designed as a living document, this template allows cities to regularly update their activities, making their progress visible to fellow pilots and consortium partners. It includes dedicated slides for LLL initiatives, where pilot cities can visually and concisely present recent developments, supported by photos and brief explanations.

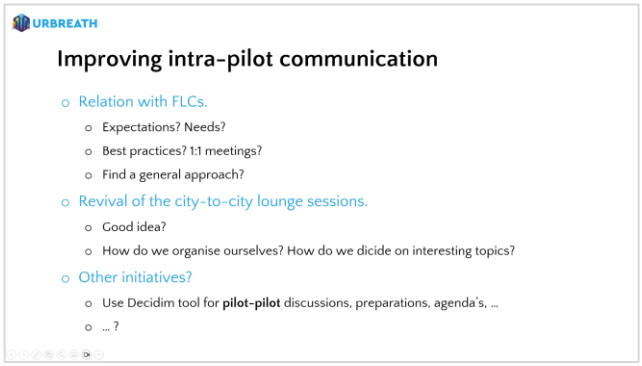
Following an internal face-to-face meeting with WPs 3, 4, and 5 in April 2025, and after collecting individual feedback from pilot cities, an urgent need emerged for improved communication within and between the technical teams and pilot cities.

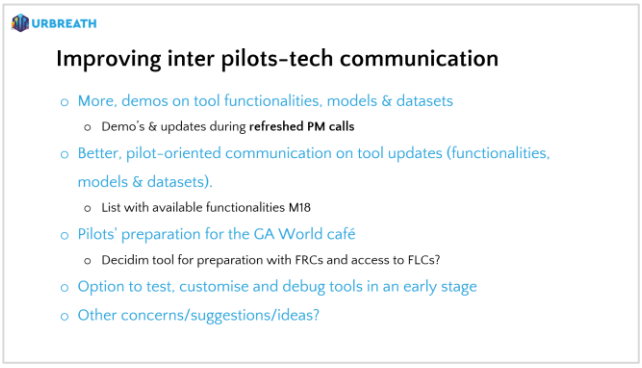
This need arose as the URBREATH project entered a more intensive implementation phase, with new tools and functionalities becoming available and LLL activities accelerating, often facing complex challenges. The lack of clear, structured, and hands-on updates on tool development, as well as the limited exchange of ideas and needs among pilot partners, were seen as critical bottlenecks.

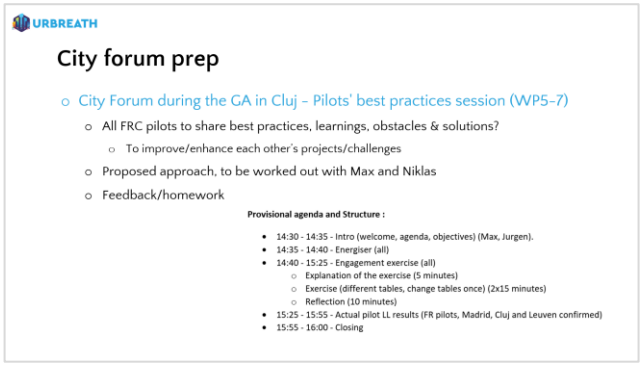
In response, WP5, Task 5.2, led the development of a communication improvement plan. On **April 30th, 2025**, a dedicated meeting was convened with representatives from all URBREATH front-runner cities. This participatory brainstorm session, grounded in Living Lab principles, aimed to redesign intra-pilot communication and strengthen the dialogue between cities and technical teams.

Figure 40: A selection of slides presented during an internal workshop bringing together front-runner cities to brainstorm about better intra-pilot and inter-pilot tech team communication after entering a new phase in the URBREATH project.



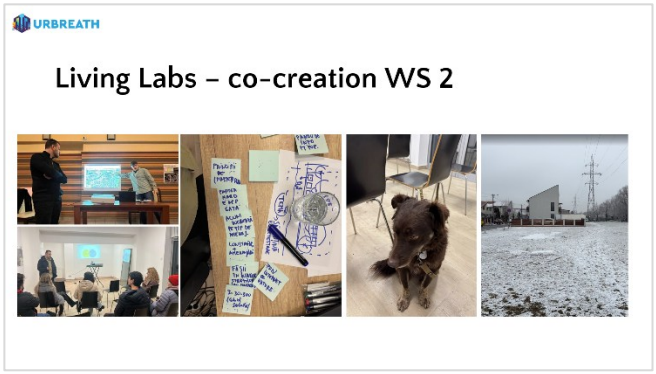






The result of this effort was launched during the upgraded "**Monthly Cities Call 2.0**" on **May 9th, 2025**. Facilitated and chaired by WP5 Task 5.2, each pilot city used the new PowerPoint template to present their recent activities, ongoing challenges, and progress updates. The interactive nature of the session immediately fostered peer learning and real-time problem-solving. Communication gaps were addressed on the spot, marking a significant improvement.

Figure 41: Selection of slides of the pilot cities Leuven and Cluj-Napoca, presenting their LLL updates at the first monthly cities call 2.0 held in May 2025.



Several structural suggestions emerged during and after the session, aimed at further enhancing collaboration:

- **Refined format for monthly cities calls**: The structured template proved effective and will continue to be used. Pilot cities are encouraged to co-create the agenda, adding discussion points and consulting peers and technical teams.
- **Improved communication from technical teams**: Clearer updates on the development status, functionalities, and simulations of tools and models are needed, as technical developments are currently progressing rapidly, making it challenging to maintain an overview. Pilot cities, in turn, will more consistently share feedback and insights gathered from one-on-one technical consultations.
- **Need for tool demonstrations and documentation**: Pilot-oriented demos should be integrated into the monthly project management meetings, ideally with dedicated Q&A sessions. Additionally, documentation or manuals on how to use the tools are necessary, as exemplified by recent webinars on the VCS and LDT functionalities.
- **Access to test environments**: Pilots expressed a strong need for sandbox environments to test and evaluate tools before implementing them in the real world.

The immediate response from technical partners was highly encouraging. During the same monthly call, they showcased new features in the e-participation tool (including its mobile version), the NBS catalogue, the Toolbox landing page, and the LDT shadow and tree growth simulators.

This collaborative momentum continued in the days that followed, with technical teams proactively sharing overviews of available tools, functionalities, and development progress. The cherry on the cake was the well-received, impressive "Demo Café" during the General Assembly in Cluj-Napoca, where partners provided live demonstrations of key URBREATH tools.

Looking ahead, WP5 aims to maintain this collaborative and transparent approach in future monthly cities calls by:

- Providing space for pilot cities to exchange best practices, lessons learned, and hands-on insights.
- Encouraging open discussion of implementation challenges.
- Strengthening the collective capacity of the URBREATH consortium to run effective and impactful LLLs.

This evolution in communication not only enhances coordination and understanding across work packages and cities but also reinforces the collaborative spirit essential for the success of the URBREATH project.

4.3.2 One-to-one meeting with pilot involvement

In addition to chairing the monthly cities calls under Task 5.2, WP5 actively supports pilot cities through one-on-one or small group meetings. These interactions—often including both pilot and technical partners—address a wide range of topics, from the development and implementation of LLLs to the integration of models, tools, and data systems.

Below is an overview of these bilateral and small group activities undertaken since the start of the solution phase, between January and June 2025:

- **January & February**:
    - Online meetings with **Aarhus** and **Pilsen** to discuss and adjust their LLL plans and strategies.
    - Online meetings with **Latitudo40** and **Madrid** focusing on the local implementation of flooding and heat stress models.
- **February**:
    - In-person meeting in **Eindhoven** with an NBS expert and representatives from the city of **Leuven to exchange ideas** on NBS-planning, co-creation and participation. The session included a cycling tour showcasing local NBS best practices and was aimed at peer-to-peer learning.
    - Online session with **ENG** and the city of **Cluj-Napoca** to define (sensor) data requirements for their use case.
- **March**:
    - Online meetings with **Leuven** concerning the LLL implementation and a site visit to the **Krakau** pilot area.
    - Continued coordination with **Aarhus**, **VCS**, and **ENG** on the customisation of the LDT.
    - Meetings with WP6 and the individual front-runner cities to align NBS planning and evaluation activities.
- **April**:
    - Online discussions about updated pilot site locations in **Madrid**, **Leuven**, and **Athens**, assessing their implications for WP5 (Tasks 5.4, 5.5, and 5.6) and WP6 activities.
    - On-site participation in an LLL session in the **Krakau** area, **Leuven**.
    - Continued LDT customisation meetings with **Aarhus**, **VCS**, and **ENG**.
    - Online bilateral meeting between **Leuven** and **Cluj-Napoca** to explore synergies, including shared interest in AR/VR applications.
    - Participation in **four WP6 meetings** with the URBREATH front-runner cities to discuss the timeline of their project's plan of work.

- **May**:
    - Online meeting between **Tallinn**, **Kajaani**, and WP3 to coordinate modelling needs for snowmelt pile simulations.
    - Follow-up workshop with pilot cities grouped by climatic zones, coordinated with WP2.
    - Continued LDT customisation discussions with **Aarhus**, **VCS**, and **ENG**.
- **June**:
    - **Alignment meetings** with WP6 and WP7.
    - Two WP5 Task 5.4 coordination meetings involving all pilot cities and **VCS**, addressing co-creative design approaches and digital tool integration.
    - **Cluster meetings with the European Commission** (March and June), sharing progress and cross-pilot insights.
    - Participation in **five follow-up meetings** with each of the URBREATH follower cities on their development plans. For each follower city, tailored questions were prepared concerning their co-creation and participation plans.
    - Co-organisation of the first in a series of nine **training sessions** with the city of Leuven on the use of LDT as an LLL supporting tool.

These targeted bilateral and group meetings are essential to complement the collective coordination efforts and ensure tailored support for pilot cities. They enable WP5 to align with city-specific needs while facilitating knowledge exchange, technical alignment, and collaborative development throughout the URBREATH project lifecycle.

4.4 Pilot-specific Local Living Lab initiatives

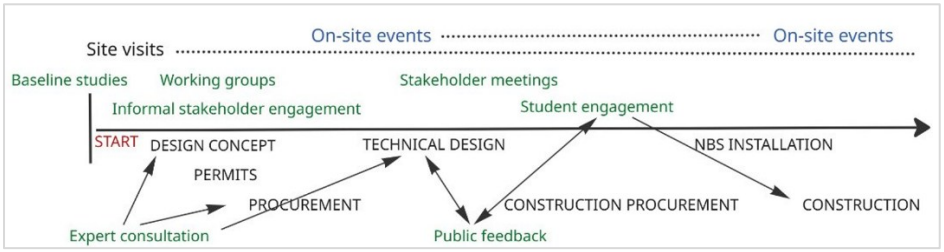
Entering the solution phase, LLL initiatives started. In this chapter, we provide a brief overview of the initiatives undertaken by each of the pilot cities.

4.4.1 Boreal climatic zone

Front-runner city Tallinn

Co-creation sessions with stakeholders were planned from May to August, including site visits and workshops.

Figure 42: Tallinn's plan of approach for NBS integration.



- In **May 2025**, Tallinn got actively involved with the key stakeholder groups, sauna users and winter swimmers. During a live workshop, after a presentation of the NBS plans by the city of Tallinn, these stakeholders share their insights and ideas on the NBS planned for the area.
- A public event is planned in the area as part of the Tallinn Urban Space Festival. (**June 13-14**)

Figure 43: Impressions from the Tallinn LLL activities.

Follower city Kajaani

- Cross-sectoral pilot site selection with a change of pilot location (from Maasto to Pyykönpuro) as a result. Stakeholders involved are the Land Use Department, Planning and Land Authority Department of Kajaani, Department of Environmental Technology of Kajaani, and City Depot of Kajaani. (**February 2025**)
- Survey on snow dumping and littering. The involved stakeholders are the citizens of Kajaani. The results of the survey provide a baseline for KPIs related to the residents' satisfaction and give ideas and feedback for reducing littering (litter directly impacts the snowmelt water). (**May 2025**)
- Planned: Interactive invasive species destruction (related to the biodiversity of the NBS site) with citizens. (**Summer 2025**)
- Planned: Workshop on the impact of littering on the success of NBS with citizens. (**September 2025**)

Figure 44: Impressions from the Kajaani LLL activities.

4.4.2 Atlantic climatic zone

Front-runner city Leuven

- In **April 2025**, Leuven organised a co-creative LLL on site with the residents to capture their ideas and insights on the NBS design of the area.
- In **May 2025**, Leuven organised a dedicated LLL with the accessibility Council of the city of Leuven. It was very interesting to gather input from people with disabilities and hear about their experiences with environmental changes.
- Focus group in **June 2025** on the redevelopment of public squares as part of the Green Deal, aimed at gathering interactive input from specialists on accessibility.

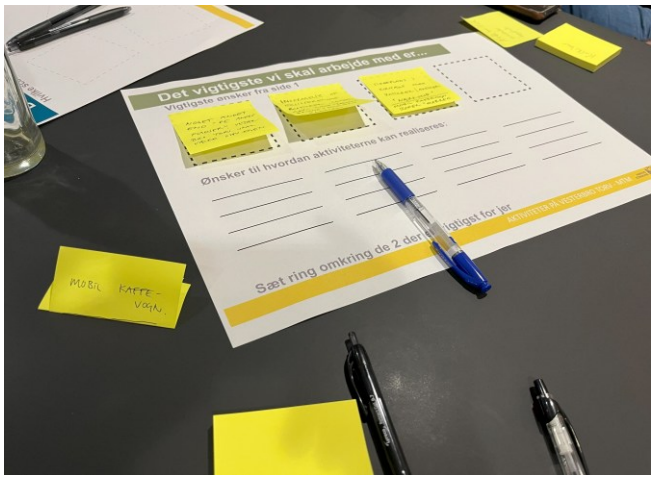
- Planned: Preliminary design showcase (hopefully in VCS map/storyboard) with citizens in **September 2025** and **November 2025**.

Figure 45: Impressions from the Leuven LLL activities.

Follower city Aarhus

- Citizen engagement about the remodelling with the citizen follower group, citizens of the area, and city experts. (**January 2025**)
- Planned: Expert Living Lab workshops with city experts such as city planners, mobility experts, architects, and citizen engagement experts. (**June and September 2025**)
- Planned: Living Lab workshop about urban greening and a liveable city with stakeholders from the private sector, research, and city experts. Co-organised with Bloxhub. (**late June 2025**)

Figure 46: Impressions from the Aarhus LLL activities.



4.4.3 Mediterranean climatic zone

Front-runner city Madrid

In general, methods used to engage stakeholders include collective walks, interviews, discussion groups, workshops based on debates, and drawings of the public spaces in sessions.

- Social study on public places in the Villaverde district with working class stakeholders with different ethnical backgrounds. (Report **April 2025**)
- Interdepartmental Working Group collective tour of the district to analyse the areas of opportunity and determine the sites of intervention. (**November 2024**)
- Interdepartmental Working Group with different departments. (**Autumn 2024**)
- Co-design meetings in San Cristobal with local merchants. (**Autumn 2024**)
- Co-design session with the neighbourhood to discuss potential nuisance caused by NBS. (**June 2025**)

Figure 47: Impressions from the Madrid LLL activities.

Follower city Athens

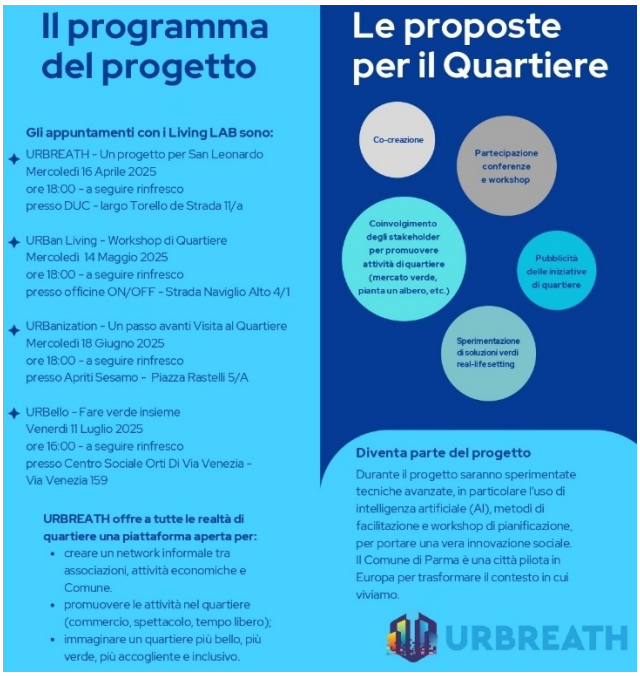
- On-site/off-site meetings and brainstorming for co-designing the integration of the archaeological findings with NBS with the most essential stakeholders in the neighbourhood. (**April 2025**)

Figure 48: Impressions from the Athens LLL activities.

Follower city Parma

- Living labs based on collaboration and open innovation, focusing on the research and testing processes. (**April 2025**)
- Planned: Participatory event with local stakeholders.

Figure 49: Impressions from the Parma LLL activities.



4.4.4 Continental climatic zone

Front-runner city Cluj-Napoca

- Following the Local Actors Network Activation in September 2024, two interactive sessions were organised with the communities of Iris and Someseni, providing a platform for citizens to share insights and innovative ideas. (**January 2025**), and a 2-week workshop organised in **April-May** with USAMV students for delivering landscape designs for NBS adaptation, based on the community's requirements. Stakeholders include students, NGOs, academic experts, and representatives from the Cluj Metropolitan Zone.
- Presentation of the final co-designed landscape plans to the broader public, allowing them to vote for the best solution (**May 2025**).

Figure 50: Impressions from the Cluj-Napoca LLL activities.

Follower city Pilsen

- Exhibition of the architectural designs of the city square of Pilsen in collaboration with the Urban Planning Institute ÚKRMP (**January-February 2025**). Input was received from citizens and other stakeholders during this event.

Figure 51: Impressions from the Pilsen LLL activities.

4.5 Early dissemination of Local Living Lab approaches

The LLL work was disseminated on different occasions during this first reporting period.

- **Trefdag Digitaal Vlaanderen** 2024 (October 2024 - Ghent, Jurgen Silence) - presenting the LDT tools and LLL approach at the Digital Flanders booth. Short report published on the URBREATH website and social media.
- **SCEWC 2024** (November 2024 - Barcelona, Jurgen Silence) – getting new insights in LLL, NBS, LDTs and the use of XR. On-site contacts with the cities of Leuven, Cluj-Napoca, and Pilsen. On-site contacts with LC and VCS.
- **Climate Data event** (February 2025 - Leuven, Jurgen Silence and Laura Dens). Presentation of the URBREATH project and the LLL approach. Participation in a discussion panel. Short report published on the URBREATH website and on social media.
- **EU Cities Mission Conference** (May 2025 - Vilnius, Max Beijneveld and Marina Klitsi). Part of a panel discussion titled "Reflecting on Methods, Indicators & Tools for Inclusive, Climate-Neutral Cities". Short report published on the URBREATH website and on social media.

- **Citiverse Conference** (May 2025 – Tampere, Jurgen Silence and Seppo Hataaja). Sharing knowledge on LLL, NBS, urban climate modelling, biodiversity measurement, traffic flow modelling and the use of open standards. Innature project with Tampere University (link with Kajaani).
- **VVSG Trefdag** (June 2025 - Ghent, Jurgen Silence). Learnings on the local use of digital tools and models, including traffic monitoring.

Figure 52: From left to right, row by row: URBREATH presentation at the Trefdag, Climate Data event Leuven, the EU Cities Mission conference Vilnius and the Citiverse Conference in Tampere.

5. Further activities and further steps

The next follow-up version of this report is scheduled for Month 24 (December 2025). Over the coming six months, the planned activities and steps for Task 5.3 will build upon the work initiated during the first 18 months, although we anticipate a shift in focus and emphasis as the project evolves.

- WP5 will continue organising additional **train-the-trainer sessions**, particularly focused on the **ideation** and **co-creation** steps of the solution phase. However, where relevant, we may already begin addressing aspects of the upcoming deployment phase, including **implementation** and **evaluation**, and how these affect the focus of the LLLs and the engagement of relevant stakeholders. The promising concept of the Toolbox exercise described in Chapter 4.2.2 will be extended with additional workshops, exploring not only the use of tools, but also how modelling and the e-participation platform can support LLL activities.
- WP5 will maintain its **support to technical partners** through Tasks 5.2 and 5.3 during the development of **tools and simulation models that aid the LLLs**. In collaboration with Tasks 5.4, 5.5, and 5.6, WP5 will also help fine-tune and implement these tools locally. During this reporting period, we expect new functionalities to emerge, especially based on the further development of previously non-prioritised use cases from pilot cities.
- WP5 will continue to supervise, prepare, and chair the **monthly cities calls** with all pilots, while remaining open to new ideas from cities and adapting formats accordingly. WP5 will ensure that the PowerPoint templates summarising each city's use case remain up to date, helping all cities and consortium partners stay aligned on current activities. With more tools and models being tested and used in the LLLs, we expect a stronger focus on the non-prioritised use cases, which will likely lead to new developments. As a result, deeper collaboration between pilot cities and technical partners is anticipated, with more frequent demonstrations of new functionalities during these monthly calls. WP5 will also continue to safeguard the pilot-oriented nature of the monthly project management meetings, making them more broadly relevant and supported.
- Additionally, WP5 will carry on with **tailored one-to-one support for pilot cities** at the LLL level—supporting LLL managers, stakeholder managers, and pilot managers in their interactions with technical partners. We will continue to offer guidance, expertise, and consultation where needed to strengthen the establishment and operation of the LLLs.
- Finally, WP5 will keep **disseminating** its activities, results, and overall progress of the URBREATH project to a broader audience, ensuring visibility and knowledge sharing throughout this next reporting period.

6. References

- Aniche L., Edelenbos J., Gianoli A., Enseñado E., Makousiari E., DeLosRíos-White M., Caruso R., Zalokar S., (2024) Boosting co-creation of Nature-based Solutions within Living Labs: Interrelating enablers using Interpretive Structural Modelling, Environmental Science & Policy, Volume 161, https://doi.org/10.1016/j.envsci.2024.103873

7. Annexes

ANNEX I – technical functionalities

	Central catalog/library	Priority	BOR	ATL	MED	CONT	Tech team(s)
1	A centralised catalogue/library to federate existing municipal systems offering a unique point of access to documents, plans, datasets, models, … related to NBS f.i. in the district Villaverde.	1	x	x	x	x	ENG, ATC
1.1	A **NBS catalogue** to support the definition of NBS interventions. To be integrated into the centralised catalogue. F.i. to find an analysis of interest to evaluate the effectiveness of a NBS.	1	x		x		ATC, ENG, VCS
1.2	**Connect** maps showing simulation/scenario results.	1	x		x	x	ATC, ENG, VCS
1.3	**Connect** map with locations were NBS are implemented already. = LDT visualisation, see LDT viewer.	1	x		x	x	ATC, ENG, VCS
1.4	Search function helps users to search/find/access/download specific datasets. Requires: Catalog	1	x		x		ENG, VCS, ATC
1.5	Geolocated search. Draw an area to find all datasets in this area. Requires: Catalog and each dataset needs a geolocation and / or BBOX	2			x		**ENG, VCS**
1.6	Notification/alerting of stakeholders when new datasets are available, or data are up-dated in the central library.	3			x		ENG
1.7	The use of generative AI (NotebookLM or other) to summarise documents.	3	x		x		VCS
1.8	Option to publish new datasets.	1	x		x		ENG, VCS, others
2	**Case demonstration tools - to cocreate & participate (LLL)**	**2**	**BOR**	**ATL**	**MED**	**CONT**	**Tech team(s)**
2.1	Case demonstration - split screen 1 : LDT.	1	x	x	x	x	VCS
2.2	Case demonstration - split screen 2 : story telling tool.	1	x	x	x	x	VCS

2.3	Case demonstration - visualise different scenarios in the LDT.	2	x	x	x	x	VCS
2.4	Case demonstration - visualise simulation results (VC-map connection) as a layer in the LDT.	1	x	x	x	x	VCS
2.5	Case demonstration - use of VR to demonstrate the TO BE situation.	1		x		x	VCS
3	**Digital Twin viewer. To visualise datasets.**	**3**	**BOR**	**ATL**	**MED**	**CONT**	**Tech team(s)**
3.1	Viewer itself. Data to visualise are found in the catalogue.	1	x	x	x	x	VCS, ENG
3.2	A Geoserver to publish geographic data.	1			x		ENG, DEDA, involved partners
3.3	Map layers **produced by simulations** and **analyses** to visualise results.	1	x	x	x	x	ATC, VCS, ENG, DEDA, involved partners
3.4	Map with locations were NBS are implemented already.	3	x		x	x	ATC, ENG, VCS
3.5	Immediate access to district data via the catalogue.	1	x	x	x	x	VCS, ENG
3.6	Real-time data access needed for sensors: traffic.	3	x	x			
3.7	Real-time data access needed for sensors: air quality.	3			x	x	
3.8	Modelled traffic information.	3			x	x	
3.9	Modelled air quality information.	3			x	x	
	Real-time data access needed for sensors: noise.						
3.10	Add feedback-comments, and vote in the LDT environment	3	x			x	VCS, ENG
3.11	Functionality for LL-members to draw/sketch (f.i. alternative route to the beach, Tallinn)	1	x				VCS
4	**Simulations and scenarios**. 3 types.	2	**BOR**	**ATL**	**MED**	**CONT**	**Tech team(s)**
4.1	Simulator type 1 - **priority locations** to install NBS (Approach = stepwise control panel) 1. select parameters (toggle parameters on/off) 2. give weight to parameters (using sliders)	3	x	x	x	x	ATC, VCS

	3. press "simulate" button & show result on map (LDT) or dashboard (KPI-dashboard) in toolbox iFrame.						
4.1.1	Simulator type 1 - what locations should be **prioritised to deploy NBS**? Based on low 3-30-300 scores Based on lowest BAF scores Based on lowest recreational value scores Based on vulnerability concerning extreme events of floods and draughts as monitored by FIC	1	x	x	x	x	VITO, DEDA, VCS, ATC, ENG
4.1.3	Simulator type 1 - Identification and evaluation of potential locations to deposit collected snow.	3	x				VCS, others
4.2	Simulator type 2 - **what-if analyses - NBS effects** (Approach = stepwise control panel) 1. select parameters (webpage, toggle parameters on/off) 2. give numbers to parameters: for example, 100 trees, 50m2 greenery added, ... 3. press "simulate" button & show scores + other relevant information.	3	x	x	x	x	ATC, VCS, ENG
4.2.1	Simulator type 2 - NBS effect on ecological value.	1	x	x		x	~~FIC~~
4.2.2	Simulator type 2 - NBS effect on shadow impact (trees, buildings), using Cesium simulator (hour/day)	1	x	x	x	x	VCS, ENG, VITO
4.2.3	Simulator type 2 - NBS effect on traffic & on air quality, ATC model	3		x			ATC
4.2.4	Simulator type 2 - NBS effect on climate resilience - water retention, floodings & flood risks	1	x	x	x	x	VITO, EXUS
4.2.5	Simulator type 2 - NBS effect on climate resilience - heatwave-, heat island-, droughts- & cooling effects.	1	x	x	x	x	FIC, Lat40
4.2.6	Simulator type 2 - effect on socio-economic value.	1	x	x	x	x	ICCS
4.3	Simulator type 3 - **what-if analyses - find optimal NBS** (Approach = stepwise control panel) 1. select parameters (webpage, toggle parameters on/off)	3					

	2. give numbers to parameters: for example, 100 trees, 50m2 greenery added, ... 3. press "simulate" button & show scores + other relevant information.						
4.3.1	Choose tree species to plant. Resilient to future climate changes.	3				x	FIC (needed bio-diversity partner or experts)
4.3.2	Weather forecast short term to alert when analysis of snow melt areas is to be started. Alerts to maintenance teams when heavy snow is expected.	2	x				FIC (needed part-ner or experts)
4.3.3	Climate modelling long term information (FIC) to make climate projections – Allows defi-nition of NBSs under future climatic conditions of snow and snowmelt and not on the ba-sis of current conditions.	2	x				~~FIC~~
5	**Analyses of impact and effect measurements (before/after effects) NBS**	**3**	**BOR**	**ATL**	**MED**	**CONT**	**Tech team(s)**
	ADD info from KPI analysis with pilots	**2**					
5.1	**BIOLOGY - ECOLOGY - HEALTH**	**3**	**BOR**	**ATL**	**MED**	**CONT**	
5.1.1	Biodiversity.	3	x	x	x	x	VITO
5.1.2	3-30-300 index. For quantitative analysis & accessibility of green.	3	x	x	x	x	VITO, DEDA
5.1.3	Biotope Area Factor - BAF.	3	x	x	x	x	VITO - Manual Berlin https://www.berlin.de/sen/uvk/en/nature-and-green/landscape-planning/baf-biotope-area-factor/calculating-the-baf/ Leuven Ph.D.

							thesis for extended version.
5.1.4	Air quality - CO2 (sensor or model info)	3				x	
5.2	**CLIMATE RESILIENCE**	**3**	**BOR**	**ATL**	**MED**	**CONT**	
5.2.1	Heat stress - draughts: shadow impact (buildings and trees).	3			x		VCS
5.2.2	Climate analyses and forecasts modelling (heat island effects, heat waves).	3			x	x	FIC
5.2.3	~~Climate modelling~~ short term information (FIC) to predict the volume of snow & needed capacity of deposit spot(s). Historical weather info and weather station live data needed.	3	x				FIC
5.3	**MOBILITY - ACCESSIBILITY**	**3**	**BOR**	**ATL**	**MED**	**CONT**	
5.3.1	Mobility & modal shift.	3	x		x		VCS, ICCS
5.3.2	Accessibility - To detect critical conditions about accessibility from specific locations	3	x				ICCS, VCS
5.4	**SOCIO ECONOMIC**	**3**					
5.4.1	Recreation value.	3	x	x	x	x	VITO
5.4.2	Land use, crowd monitoring.	3	x		x		VCS, ICCS
5.4.3	socio-economic value/impact.	3	x		x	x	ICCS
5.4.4	*3-30-300 index also fits here*	*3*					
6	**E-participation tool**	**3**	**BOR**	**ATL**	**MED**	**CONT**	**Tech team(s)**
6.1	Tool to participate/cocreate: share content (docs, plans, scetches, …) with stakeholders.	1	x	x	x	x	VCS, TEL, ENG, others
6.2	- Get info from universities	1	x			x	
6.3	- Share results, ideas, options, good practices	1	x	x	x	x	
6.4	Tool to participate/cocreate: interact with stakeholders through communication channels (meeting rooms, chats)	1	x	x	x	x	

6.6	Tool to participate/cocreate : connected LDT & other visualisation tools (for datasets & simulations)	1	x	x	x	x	
6.7	- visualisation of NBS (projects) on a map	1	x		x		VCS
6.8	Tool to participate/cocreate : geolocation of NBS	1	x		x		
6.21	Tool to participate/cocreate : support for decision-making	1			x		
6.24	Tool to participate/cocreate : public channel to interact with citizens	1	x	x	x	x	
6.26	NBS scenarios & simulations : comment/feedback, vote (not for Leuven), suggest ideas	1	x	x	x	x	