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

D2.1 - URBREATH methodological framework for urban greening Living Labs and hybrid/ NBS interventions and adaptive pathways

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Contributor(s)	Giuseppe Ciulla, ENG Jurgen Silence, VLO
Reviewer(s)	Max Beijneveld, CA Alisa Krumm, FRAUNHOFER
Document description	The deliverable has two main objectives: presenting the results of a benchmarking investigation on e-participation tools, and outlining the URBREATH methodology. These sections provide the foundation for the URBREATH project, supporting ICT implementation and digital integration of e-participation tools, and structuring the project's framework.

	The URBREATH methodology focuses on two key elements: 1. Co-creation activities: Adapted from service design, these activities facilitate collaboration among cities and partners, enabling information collection and task performance. 2. Local Living Labs: Environments where diverse stakeholders collaborate to develop, test, and refine innovative solutions in real-life settings. This deliverable is the first of three releases and is considered a "living document," with methods and tools updated as the project progresses. The methodology is experimental and will be integrated with future tasks and results.

Document Revision History

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		Modification Reason	**Modified by**
V 0.1	27th May 2024	TOC drafted by POLIMI	POLIMI
V 0.2	28th June 2024	Basic information updated by POLIMI	POLIMI
V 0.3	1th July 2024	Re.organisation of TOC and topics to be presented in the Deliverable, introductory chapters and academic background included	POLIMI
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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

The main objective of this deliverable is twofold:

- Presenting the results of the benchmarking investigation on e-participation tools, which will serve as a basis for the technical partners to develop and deploy functionalities for the URBREATH platform and toolbox.
- Outlining the URBREATH methodology aimed at developing a blueprint to inform the other work packages (WPs) and the parallel task of requirements definition.

These two sections, while different in content, are crucial in providing the foundation and general background for the development of the URBREATH project. The benchmarking supports the activities related to the implementation and deployment of ICT (Information and Communication Technologies) and the digital integration of e-participation tools by technical partners. The methodology serves as the basis on which the project is structured, organized, and executed.

Overall, the URBREATH methodology describes how the consortium frames and designs its collaborative work, focusing on two essential elements:

- **A set of co-creation activities**. Primarily adapted from service design, these activities structure the collaborative interaction among the nine cities and the 'non-city' partners, enabling the collection of information and the progressive performance of tasks towards the implementation and use of the URBREATH platform.

- **The establishment of Local Living Labs**. These are environments where networks of stakeholders from diverse backgrounds, including citizens, researchers, private and public entities, collaborate to develop, test, and refine the URBREATH project's innovative solutions. These Labs focus on real-life settings, enabling practical experimentation and co-creation of solutions that address specific local needs and contexts.

This Deliverable is the first of three releases of the methodology. It should be considered a "living document," where methods and tools will be updated and added as the project progresses. Rather than a single methodology, the URBREATH methodology represents a set of synergistic methodologies. It combines a range of tools and methods from various disciplinary fields that address specific project needs. In this regard, the methodology is experimental and is intended to be subsequently integrated, both in relation to new needs arising from the development of future tasks and in relation to the results of experimentation and the need for modifications and adaptations.

This document has been produced by the Politecnico di Milano team, which is leading Task 2.1. However, the development of the methods, tools, and principles of the methodology was carried out through a co-creative process, with all partners agreeing to and committing to them.

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Abbreviation	Definition
NBS	Nature-based Solutions
AI	Artificial Intelligence
DT	Digital Twin
ICT	Information and Communication Technologies
IT	Information technology
WP(s)	Work Package(s)
LLL	Local Living Labs

1 Introduction

Over the past decade, there has been a growing focus on sustainable urban development within EU policies, aligned with the Agenda 2030 objectives and recent legislation (European Green Deal, 2019; Biodiversity Strategy, 2020; Nature Restoration Regulation, 2024). One key component supporting sustainable development in EU countries is the introduction of nature restoration policies and interventions, adopting Nature-Based Solutions (NBS) to gradually reverse current urban development trends, reduce soil consumption and pollution, and promote more sustainable, climate-friendly, and climate-resilient actions for biodiversity and nature.

Due to the growth of urbanisation processes, cities play a particularly significant role in supporting biodiversity, combating climate change, and enabling more climate-resilient processes and projects. At the same time, cities are undergoing significant changes due to the progressive implementation and use of digital technologies and, more recently, Artificial Intelligence. These technologies have transformed and are continuing to transform public services and the relationship between municipalities and citizens, offering numerous new opportunities while simultaneously creating many challenges related to the scarcity of economic and human resources and the need for profound changes in existing processes. The latest opportunities include the introduction of Digital Twins for simulating scenarios and implementing Nature-Based Solutions (NBS), as well as e-participation tools to engage a broader community in decision-making processes.

The URBREATH project combines the increasing adoption of digital technologies to support urban development (digital tools for participation and Digital Twins) with the actual implementation of re-naturing plans in various regeneration areas across Europe. The project has a dual nature that challenges conventional approaches to theory and practice, as will be explained in the following paragraphs.

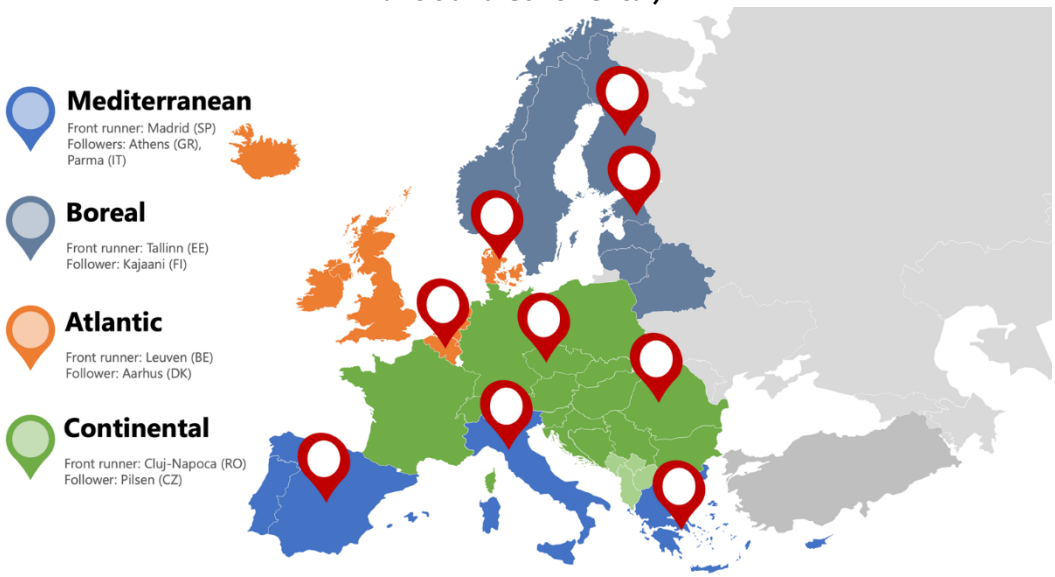
1.1 Project objectives

URBREATH aims to develop and implement the European Commission's aspirations for hybrid solutions and climate adaptation, with Nature-Based Solutions (NBS) serving as the backbone of nature restoration activities and, more broadly, as the foundation for sustainable, climate-neutral, and equitable development. It also seeks to facilitate planning activities and regulations for the restoration and renewal of pilot areas (micro-level), enabling these efforts to be replicated and scaled up to regional, national, and cross-boundary levels.

This project involves nine cities located in four different climatic areas. Their positioning is a key element in better understanding the heterogeneous climate conditions and potential needs of the selected pilot areas, particularly concerning NBS deployment. URBREATH is based on the Lighthouse-Follower methodology, where Lighthouse Cities (namely FrontRunner Cities - FRCs) will foresee the actual implementation of the co-created interventions and NBS implementation. At the same time,

Follower Cities (FLCs), under the proactive guidance of the FRCs, should develop their co-created plans, with no obligation to implement NBS. Each FrontRunner City is coupled with at least one Follower City, and Figure 1 shows the internal subdivision among the identified climate areas.
The cities of the different climate zones are experiencing various climate challenges and hazards, which enable urban exchanges among FRCs, more mature, and FLCs, less mature and smaller in terms of NBS and smart technology development. In some instances, FRCs and FLCs are experiencing similar challenges, either linked to their specific climatic areas or to strategies and best practices to cope with climate change and adaptation. In this regard, URBREATH aims to create a working environment where stakeholders (e.g., local governments, citizens, academia, and the private sector) interact and co-create NBS-related urban scenarios, using recent technologies and Digital Twins (DT), supporting co-designed processes, social innovation, and sustainable development.

Figure 1: Front Runner and Follower Cities divided by the four climatic zones (Mediterranean, Boreal, Atlantic and Continental)



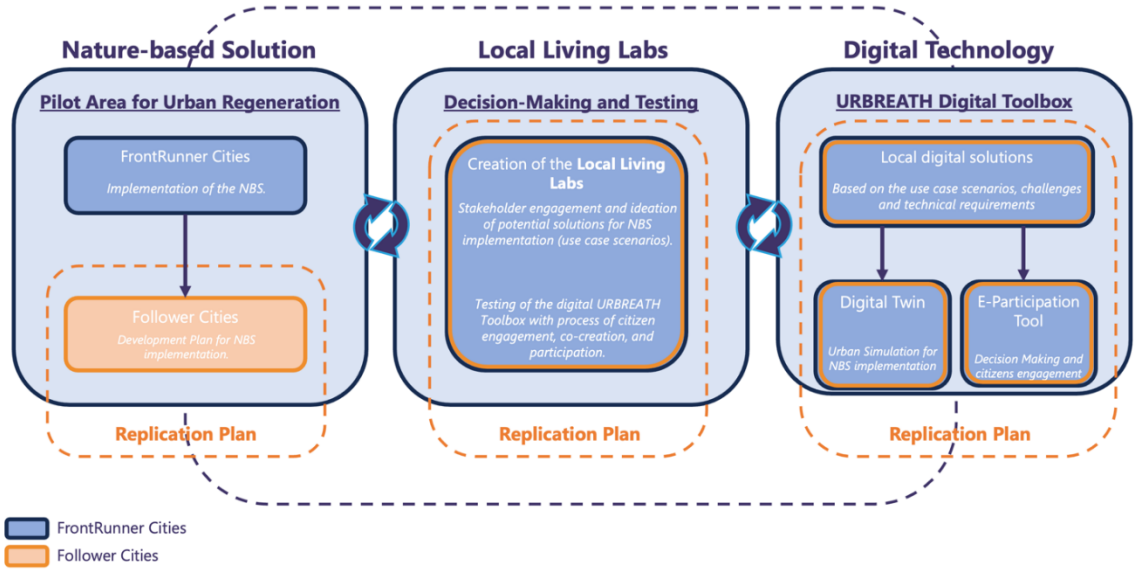
Credits: URBREATH Team

The aim of URBREATH is to combine the FrontRunner and Follower Cities' pilot areas, including the implementation of NBS, with experimentation and simulation of use case scenarios using Digital Twins, and participatory processes and citizen engagement via e-participation tools. At the same time, the Local Living Labs enable testing and validation of the URBREATH digital toolbox and decision-making related to the implementation of the desired NBS.
The pilots are chosen to experiment with NBS implementation, climate adaptation, and urban regeneration in specific areas of the city that face notable natural hazards. The selected areas serve as the locations where experimentations will take place. The kind of testing relates to:

- **NBS implementation in the pilot area**, supported by the digital technology of urban simulation and scenario creation (Digital Twins), and digital deliberative democracy facilitated by the e-participation tools.
- T**he creation of Local Living Labs in the cities (with specific reference to the pilot site)**, which will develop a prototype of decision-making arenas, including different local stakeholders from heterogeneous spheres. The Local Living Labs will be supported by the digital toolbox and will have the possibility to decide the development and implementation of NBS in the pilot site.
- **The creation of a Digital Toolbox** (see Deliverable D2.5 - URBREATH Platform Requirements), which serves as a basis to facilitate and enable NBS implementation and decision-making processes to be more transparent, just, and inclusive. Furthermore, the designed digital toolbox is strictly related to the pilot sites, their challenges, and development scenarios: this is important to relate the pilot areas to the digital solution, and vice versa.

Figure 2 shows the different interrelations among the three main elements mentioned above, and it also points out the relations between FrontRunner Cities and Follower Cities, where activities in FrontRunner Cities will be tested to be then replicated in the Follower Cities (see orange layout). Although the main difference relates to the NBS implementation in the pilot site, both FrontRunner and Follower Cities actively contribute to the definition of the Living Labs and experimentation processes, as well as the digital requirements needed for urban simulation and deliberative democracy.

Figure 2: Scheme of the three main pillars of the URBREATH project with their integration and relations. The scheme presents also the relationships between FrontRunner Cities and Follower Cities, which base part of their experience on the one tested in the FrontRunners, and will replicate it via adapted Replication Plans



Credits: Elaboration of the authors.

URBREATH includes the creation of a methodological framework for developing innovative standardisation and applying co-creation processes towards 'eco-unifying mechanisms' [1] (see Ochoa-Hueso, 2021). In URBREATH, the aim is to promote a synergistic use of hybrid solutions and NBS, among other interventions, to empower citizen participation and co-creation activities to demonstrate innovative approaches and multidisciplinary topics and expertise, which contribute to urban regeneration, resilience, and climate neutrality.

In doing so, the URBREATH Consortium is composed of 37 diverse partners, corresponding to the three specific components of the project: (i) academic partners; (ii) technical and digital partners; and (iii) cities, which encompass the built environment and civil society. The academic partners contribute knowledge from recent urban planning issues, particularly regarding NBS implementation, climate-resilient development, and participatory processes. The technical partners integrate these aspects with specific data and requirements to design the URBREATH Toolbox, considering urban regeneration processes, NBS implementation, e-participation tools, and Digital Twins (DT). Civil society acts as the connecting link between government, the private sector, and society to ensure that their needs are

[1] For 'eco-unifying mechanisms', it is meant a set of actions that enhance ecosystem services and ecological product value. Through this set of actions and interventions, environmental resources can enable social value and economic growth (see Song and Du, 2024).

reflected in the NBS implemented and the tools developed. Cities actively participate in the implementation of NBS in selected areas and contribute to enhancing and designing the URBREATH Toolbox to be deployed and integrated into their specific decision-making processes and governance (see also Figure 2).

1.2 Deliverable Purpose and structure

This deliverable has a dual purpose, corresponding to two interconnected activities designed to support the URBREATH project.

On the one hand, this document aims to illustrate and benchmark the e-participation platform to provide guidance for the technical partners involved in the project (namely WP3 and WP4 partners) in choosing the most feasible and adaptable solution for online participation and citizen engagement as part of the URBREATH Toolbox. The benchmarking activity illustrated serves as a starting point for assessing the key features the URBREATH e-participation platform must have. It sets some of the preconditions on which technical partners will develop and deploy the URBREATH platform. **Section 2** serves as a starting point for assessing the key features the URBREATH e-participation tool must have. It sets some of the preconditions on which technical partners will develop and deploy the URBREATH Toolbox[2].

On the other hand, this document describes the principles, methods, and tools that structure the URBREATH methodology. In this context, the term "URBREATH methodology" refers to a set of methods and tools, adapted from service design, whose aim is to inform the design, development, use, and evaluation of the URBREATH Toolbox[3]. While this approach is well-established for designing and implementing services in the private sector, it remains relatively new in public services, particularly those related to urban planning, transformation, and regeneration.

This document is structured into four main parts. **Section 1** provides a brief introduction to the URBREATH project's aims, scope, and the goal and structure of this document. **Section 2** outlines the

[2] The benchmark of e-participation platforms complements two other documents and related tasks in WP2 (URBREATH systemic approach for co-creating urban greening and renaturing solutions), which will guide the definition of the URBREATH Toolbox:

- The use case scenarios and baselines of the nine cities involved in the project, which will provide the information, data, and development scenarios for the URBREATH Toolbox (ref. Deliverable D2.4 - Use Case Scenarios and Baselines).
- The general and shared requirements that the URBREATH Toolbox must meet to be used by different users and respond to the general needs emphasised by all the cities involved in the project (ref. Deliverable D2.5 - URBREATH Platform Requirements).

In the next project phases, WP3 (URBREATH Data Strategy and Tools) will handle programming and technology deployment, while WP4 (URBREATH Decision-Making Framework) will focus on enabling co-creation and participation by combining a Digital Twin with advanced e-participation and KPI management tools.

[3] A key example is the use of service design processes and tools for mapping users and stakeholders, defining platform requirements, creating user scenarios and journeys, designing user interactions, and developing service blueprints.

methods and initial findings of the benchmarking of e-participation tools. Section 3 details the URBREATH methodology, beginning with its rationale, including its specificities and inspiring principles. It then moves to detail the different activities carried out so far, focusing on the two main components: internal co-creation sessions and the establishment of a network of Local Living Labs. Subsection 3.2.1 covers the specific methods and tools used in internal co-creation sessions, while subsection 3.2.2 focuses on the first activity conducted to set up city living labs. Section 4 describes further activities and next steps.

This deliverable, D2.1, releases the first version of the project methodology, along with an explanation of the methods and tools applied in the activities, their scope, their process, the operative instructions that give guidance on how to use them, and their outputs. There will be two additional releases of the URBREATH methodology, which will update D2.1. This means that this document, or at least Section 3, is a living document and will be revised and validated at the end of the second year (M24) and the end of the third year (M36).

In this first release, the focus of the document is related to the backbone of the methodology, which includes:

- The design of a methodology that could serve different purposes (e.g. the organisation of co-creation sessions and processes; the setting up of the Local Living Labs; the use of service blueprints as a tool for participation) in heterogeneous contexts and institutions (Section 3.1.1).
- The organisation of a 'stepwise' process through which activities and processes could be tested and fine-tuned to be progressively validated as a collective practice among partners, both 'city' and 'non-city' ones (Section 3.1.2).
- The creation of knowledge, which serves as a general and common background for all partners. It contributes actively to strengthening collaboration and contextualisation, creating a robust engagement and exchange among the city partners and non-city ones (Section 3.1.3).
- The setting up of a framework for a collaborative workstream among different WPs and disciplines, which grants a certain level of innovation and the co-creation of the methodology itself (see Section 3.1.4).

Furthermore, D2.1 includes the two main activities that have been performed in the first year of the project (M1-M13). As a working document, these two main activities could be updated in the following releases with more information and more tools or methods employed.

2 Benchmarking of e-participation platforms

One of the key objectives of this deliverable is to orient WP4, which is responsible for the implementation of the e-participation tools and their integration within the URBREATH Toolbox. The benchmarking has been conducted specifically for this goal, investigating a variety of e-participation tools available on the market. These tools are analysed and sorted based on features identified according to the cities' needs and expectations (derived from Deliverable 'D2.4 - Use Case Scenarios and Baselines' and Deliverable 'D2.5 - URBREATH Platform Requirements').

In this context, this section aims to present an overview of the methodology applied for the benchmarking and the outcomes of this activity, including some suggested e-participation platforms. Overall, the candidate e-participation platforms (**Section 2.2**) have been selected by analysing different criteria that the URBREATH Toolbox must perform and deploy. The e-participation function is considered an essential component of the URBREATH Toolbox and one of the key elements of the project.

The benchmarking activity has been organised into two steps: (i) mapping and filtering, and (ii) candidates' functionalities. The main objective of 'mapping and filtering' is to obtain a general overview of all the e-participation tools available on the market, performing an extensive analysis and benchmarking of potential competitors and their features. The final result is a shortlist of candidate e-participation tools to be further investigated in the following step. The second step, 'candidates' functionalities,' provides a detailed analysis and investigation of the shortlisted e-participation tools, combining an in-depth description of the different criteria (see **Annex II**). This step analyses the varying degrees of participation that the platforms allow through their different features and functions.

2.1 Mapping and Filtering: First set of e-participation tools

The first mapping on e-participation tools results in a combination of 122 (see **Annex I**), taken from different references, such as Shin et al. (2024), and ORBIS (ORBIS, 2022)[4]. These 122 e-participation tools have been analysed following a set of 6 criteria:

- **Status: Active or Inactive.** This criterion extensively analyses e-participation tools presented in Shin et al. (2024) and those investigated in ORBIS (2022). As some of them do not provide any website with a corresponding online resource, this criterion considers the validation and verification of the status of each tool in the initial list. E-participation tools have been analysed based on their usage and whether the website and its deployment are still 'active'. For those that are not frequently used, or those that do not have a working website, they have been

[4] Shin et al. (2024) identified 116 digital tools to address the supply of digital tools in providing a systemic approach towards citizen engagement in policy-making and decision-making. They identify a set of different criteria defined to assess the different degrees of citizens' engagement. On the other hand, ORBIS (2022) provides an analysis of 14 e-participation tools based on three principles: inclusiveness, trust, and transparency. The aim of this investigation is to understand the level of e-participation tools to enhance deliberative democracy and to make it work better.

considered as 'inactive'[5].
The aim is to consider and benchmark only those e-participation tools that are used frequently and that are available online for different purposes.

- **Purpose of the tool: Single-purpose or Multi-purposes.** In this case, the distinction between the e-participation tools aims at considering their usage, following its main objective. The topics of climate neutrality, climate resilience, and urban adaptation are broad and multifaceted. Therefore, the selected tool(s) must be highly flexible to accommodate diverse initiatives and purposes. With this criterion, the aim is to prioritise tools that can support a variety of project categories. In some instances, the e-participation tool has been built considering only one specific objective, and it is related to a specific topic (e.g. *FixMyStreet*[6]). Overall, the categories that have been identified in considering this criterion are the following:
  - **Support Single-purpose**: These platforms are tailored for specific uses, focusing on a particular aspect of a societal issue. For example, *FixMyStreet* specialises in facilitating street problem reporting through GIS services.
  - **Support Multi-purpose**: These platforms offer adaptable services that can be applied to multiple societal issues. For example, *GoVocal*[7] provides various tools and features, allowing users to tailor participatory strategies to different topics.
  - **Other-purpose tools**: TThese platforms are not designed for deliberative democracy. For example, *Etherpad*[8] is a collaborative online document editing tool. Although it can also serve the purpose of collaborative exercise, it is not designed for deliberative democracy.

  To filter these tools, those that have been considered as 'valid' are the ones which include a 'multipurpose' approach.
- **Context: Cross-Context or Context-Specific.** This criterion is essential as the e-participation tools that will be included in the URBREATH Toolbox have to be potentially used in different contexts, with no specific limitations in terms of domains. According to this criterion, the analysis assesses each tool's adaptability and feasibility to be deployed and implemented in different contexts, excluding those that are constrained and limited to usage within one specific region or country (e.g. La Ruche, a crowdfunding platform for Quebec[9]). Overall, the analysis highlights that some e-participation tools are strictly related and combined with a specific context, which could influence the ratio and the institutional framework on which

[5] This analysis excludes 18 tools. Three of them are considered 'inactive', which means that their web pages either fail to load or explicitly indicate that the site is no longer supported. Fifteen of them are considered 'not located', which means that these tools could not be identified as the Web returned irrelevant results.

[6] Official Website: https://www.fixmystreet.com/ (Last access: Feb. 2025).

[7] Official Website: https://www.govocal.com/ (Last access: Feb. 2025).

[8] Official Website: https://etherpad.org/ (Last access: Feb.2025).

[9] For more information on the platform: https://laruchequebec.com/en/about/mission (Last access: Feb. 2025).

deliberative democracy, citizen engagement, and decision-making processes are performed. The categories used for this investigation are organised as follows:

- **Cross-context platform:** These platforms offer standardised services that are not tied to any one specific location, making them adaptable and replicable across different cities, regions, or countries. They are designed to address broader, universal needs that can be applied in various contexts (e.g. Decidim[10] or Consul[11]).
- **Context-specific platform:** These platforms are specifically designed with a particular city, region, or local context in mind. They are tailored to meet the unique needs, policies, and engagement goals of that specific community. Moreover, if the official website of the platform does not provide information in English, it will also be excluded (e.g. *Openstad*[12], which is only displaying information in Dutch).

- **Open Source.** To define how software could be open source, it is essential that its source code is freely available to the public. Unlike closed-source software (such as many commercial programs), open-source programs can be modified and distributed by anyone and are often developed by a community rather than a single organisation. According to Shin et al. (2024, p.7), open-source software 'refers to software with a source code that is publicly accessible, enabling anyone to download, replicate, modify, or contribute to future developments, such as Linux, Git, Chrome OS, and Python'. Furthermore, considering ORBIS (2022), open-source platforms are considered to have a more transparent approach.
  The methodology enabling the definition of 'open source' that has been adopted is based on the following steps: (i) identify the e-participation platform source-code repository (e.g. GitHub); (ii) check if an open-source licence is associated with the e-participation platform (e.g. MIT[13], AGPL[14], etc.). If an open-source licence is not associated, the software is considered as 'not open source'.
- **Provider country.** This criterion is essential in understanding if the software in question is GDPR (General Data Protection Regulation) compliant. The mapping consists of checking the provider country of each e-participation tool mapped, with a focus on those that are in the European Economic Area (EEA), which includes all the EU countries, and others (e.g. United Kingdom) which are not formally members of the EU but are still compliant with EU regulations concerning GDPR[15].

[10] Official Website: https://decidim.org/ (Last access: Feb. 2025).

[11] Official Website: https://consuldemocracy.org/en/ (Last access: Feb. 2025).

[12] Official Website: https://openstad.org/ (Last access: Feb. 2025)

[13] The MIT License : https://opensource.org/license/mit

[14] GNU Affero General Public License: https://opensource.org/license/agpl-v3

[15] In the specific case of the UK, the UK GDPR largely incorporates the EU GDPR regulation. This means that the core data protection principles, rights, and obligations remain very similar between the two (see: https://www.gdpradvisor.co.uk/eu-gdpr-vs-uk-gdpr#:~:text=Differences%3A,regulations%20depending%20on%20the%20jurisdiction. Last access 26th Feb. 2025).

- **Objectives: decision and open suggestions.** To have an inclusive e-participation platform, which includes the possibility both to 'decide' and to 'present and discuss options and alternatives', Shin et al. (2024) have highlighted the importance of deliberative democratic software to consider these functionalities for the specific end of making the process more inclusive. By 'decision', they mention the possibility of deciding policies, budgets, proposed recommendations, and formal documents via deliberation or vote functionalities. At the same time, Shin et al. (2024) also identify 'open suggestion' as a keyword to rely on when considering inclusion; in this case, the functionality of having 'open suggestions' allows users to propose and actively engage in public debate, using collaborative documents (e.g. Google Drive) to formulate requests and ideas.

This initial level of investigation is crucial for developing a preliminary list of potential e-participation tool candidates, starting from the 122 that have been mapped. Overall, using the aforementioned criteria to benchmark the list, **ten e-participation software tools** have been shortlisted.
Table 1 presents the candidate tools, which consider: (i) their status as 'active'; (ii) their multi-purpose approach; (iii) their cross-contextual nature; (iv) their open-source availability; (v) their provision by an EU country; and (vi) the presence of deliberative democracy functionalities.

Table 1: List of the ten-candidate e-participation platforms.

Code	Tools name	URL	Provider country
1	Adhocracy+	https://adhocracy.plus/	Germany
2	Argù	https://docs.argu.co/about.html	Netherlands
3	Citizen OS	https://citizenos.com/	Estonia
4	CONSUL	https://consuldemocracy.org/	Netherlands
5	Decidim	https://decidim.org/	Spain
6	Govocal	https://www.govocal.com/	Belgium
7	Fluicity	https://get.flui.city/en	France
8	LiquidFeedback	https://liquidfeedback.org/	Berlin
9	YourPriorities	https://www.yrpri.org/domain/3	Iceland
10	EMPATIA	https://empatia-project.eu/	Italy

Based on this initial screening, the technical partners of the project could identify which e-participation tool might be a suitable candidate for deployment and inclusion in the URBREATH Toolbox. However, given the variety of functionalities these e-participation tools offer, a second level of analysis has been conducted. This analysis aims, on the one hand, to enhance the level of detail and investigation into the potential candidates and, on the other hand, to guide technical partners (as well as the cities) regarding the available functionalities and possibilities each e-participation tool provides.

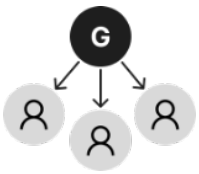
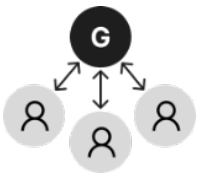
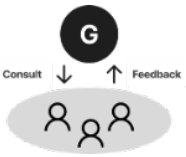
2.2 E-Participation platform candidates: levels of participation and functionalities.

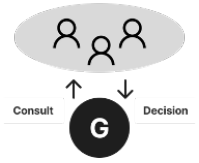
The second level of analysis presents a more in-depth investigation of the ten shortlisted candidate tools. It is indeed important that the e-participation tool responds to specific objectives related to government-citizen interaction. According to Kumar and Vragov (2009), there are three main categories based on the interaction between government and citizens in the ICT (Information and Communication Technology) domain:

- **Communication Component (CC)**, which supports only one-way dissemination of information (e.g., digitised information on the government website and email distribution lists, recorded audio and videos);
- **Deliberation Component (DC)**, which supports two-way interactions that enable citizen communication and deliberation (e.g., feedback forms, chat tools, interactive discussion boards, electronic petitions, blog posts); and
- **Voting Component (VC)**, which entails citizens' empowerment to perform collective decision-making on various types of issues (e.g., online electronic voting system).

According to the literature (Mariani et al., 2025; Mariani et al., 2023; IAP2 Public Participation Spectrum, 2024; see also Table 2), e-participation, based on government-citizen relationships, might vary and can be categorised into five different levels. These levels illustrate the government-citizen relationships, ranging from a passive level of interaction to an active level of citizen participation. The main reference used to frame these relationships is related to Mariani et al. (2025; 2023) studies. Table 2 briefly explains these different levels of interaction, according to a broader literature review. It shows the different levels of citizen engagement in e-participation tools, providing an overall vision of how these degrees might fit the transformative approach used in planning processes: from centralised decision-making activities to more collaborative, participatory, and horizontal approaches towards decision-making processes.

Table 2: Details of the e-participation tool's level of interaction.

E-Participation level	Definition	Related functionalities	Graphic
Inform	Present a one-way, top-down communication (Mariani et al., 2025; OECD, 2001). Citizens are passive receivers of the information delivered by the government (Teran & Drobnjak, 2013). Here, the functionality is further broken down into information and communication. Information means citizens need to actively seek out the information shared by the government, such as through websites and blogs. On the other hand, Communication means the government actively sends information to citizens, such as through emails, newsletters, and notifications.	Information: Digitized information on the government website, including audio and video (Kumar and Vragov, 2009). Communication: Emails (Kumar and Vragov, 2009) / Notification	
Consult	The level of 'consult' presents limited two-way communication (OECD, 2001). The government invites citizens to share feedback (Mariani et al., 2023), but limited interaction is presented (Teran & Drobnjak, 2013). This research categorises this as limited opinion-sharing, as the citizens are not the initiators of the topic but are asked to provide feedback based on an established format. This includes surveys, questionnaires, likes, feedback forms, and polls. According to Shin et al. (2024), a survey is an informal method for collecting opinions or preferences from a group of people, allowing them to respond in either open-ended or closed-ended formats.	Limited opinion-sharing: Including feedback forms (Kumar and Vragov, 2009), Polls, Questionnaires, Like (Shin et al., 2024)	
Involve	The level of 'involve' represents two-way communication (Mariani et al., 2025). Government-citizen interactions are present, allowing both parties to share feedback collectively (Teran & Drobnjak, 2013). To involve citizens and the government in sharing feedback collectively (Teran & Drobnjak, 2013) on government-initiated projects, the component of deliberation comes into play, supporting citizens in having interactive discussions (Kumar & Vragov, 2009). This research identifies discussion as the key element for the functionality to support the level of involvement.	Interactive discussion: Interactive discussion boards (Kumar and Vragov, 2009)	

Collaborate	People can offer innovative ideas and contribute to shaping public services through collaborative working (Mariani et al., 2025; Teran & Drobnjak, 2013). Government and citizens become partners, developing alternatives and identifying the preferred solution (Fedotova et al., 2012; IAP2 Public Participation Spectrum, 2024). The level of 'Collaborate' allows governments and citizens to work collaboratively and become partners in building alternatives. This research identifies two functionalities that can potentially support this level of e-participation. Firstly, real-time collaboration enables participants to communicate without transmission delay (Shin et al., 2024). Examples include chats, video conferencing, file sharing, screen sharing, and location tracking. This kind of interaction can facilitate a dynamic co-creation environment, such as a co-design workshop and direct stakeholder engagement. Secondly, open suggestion allows citizens to input comments, opinions, or critiques freely. Shin et al. (2024) mentioned that 'open suggestions' are in text format, for example, collaborative text editing. However, within the collected 10 tools, the format being used nowadays is diverse and interactive, for instance, ideation with GIS functionality and support for image uploads. The critical criterion here is that the proposal is bottom-up and citizen-initiated.	Real-time communication (Shin et al., 2024) Open suggestions: Brainstorming, idea proposal. (Shin et al., 2024)	
Empower	Delegate decision-making authority to the citizens (IAP2 Public Participation Spectrum, 2024; Mariani et al., 2025). Citizens can also have the authority to define the collaboration process and steer its evolution in partnership with the government (Teran & Drobnjak, 2013). At the level of 'Empower', decision-making authority is delegated to the citizens. This includes, for example, selecting the final solution or prioritising the proposal. While the voting functionality overlaps with the poll functionality presented in the consult level, the key differentiator here is whether the decision made by the citizens is fully implemented.	Decision-making: Voting, prioritization, Poll	

Source from: Mariani et al. (2025). Re-elaboration of the authors.

To understand how to relate these levels of interaction (Mariani et al., 2025) to more operational functionalities within the e-participation tool, we follow the relationship between ICT functionalities and government-citizen interactions proposed by Kumar & Vragov (2009). Additionally, we consider the reference from human-to-human interactions in ICT functionalities listed in Shin et al. (2024).
To determine the e-participation levels that each tool can support, the interconnection between software functionalities and e-participation levels of interaction has been used as a filter to analyse and benchmark the shortlisted e-participation platforms. This analysis evaluates each tool's functionalities to assess the extent to which they correspond with the designated e-participation levels. To visualise the results, Table 3 illustrates the number of functionalities supporting each e-participation level, ranging from 0 to 5. A value of 0 indicates that no corresponding feature is listed on the tool's official website, while values from 1 to 5 represent the number of functionalities explicitly mentioned that support the respective e-participation level (see Annex II).

Table 3: Analysis of the functionalities of each shortlisted candidate platform. The number corresponds directly to the number of functionalities mapped to it, based on the aforementioned approach.

	Inform	Consult	Involve	Collaborate	Empower
01 Adhocracy+	0	2	2	5	2
02 Argù	2	3	2	1	2
03 Citizen OS	3	1	1	1	1
04 CONSUL	0	1	2	1	2
05 Decidim	4	2	3	4	3
06 Govocal	4	3	2	5	2
07 Fluicity	2	2	1	4	3
08 LiquidFeedback	0	1	1	2	1
09 YourPriorities	4	2	1	1	1
10 EMPATIA	1	1	0	2	1

All ten tools provide citizens with the ability to submit proposals, comment on ideas, and vote on final proposals. The tools that stand out are those that incorporate diverse interface interactions to facilitate participation, ensuring a balance between one-way and two-way communication. For example,

Decidim has four functionalities that potentially support the level of collaboration (see Appendix), including Proposal (open suggestion), Meeting (real-time communication), Conference (real-time communication), and Participatory text (open suggestion). On the other hand, Citizen OS only has Idea gathering (open suggestions) that support the level of collaboration. Furthermore, some e-participation platforms lack certain interaction levels (e.g., Adhocracy+, CONSUL, LiquidFeedback, and EMPATIA). As the e-participation platform to be included in the URBREATH Toolbox requires at least one functionality for each specific level, these platforms are excluded from the final results of the benchmarking.
However, this does not imply that one tool is inherently better or more effective than others. Rather, it highlights the richness of options a tool offers, which translates to greater flexibility and a wider range of interaction possibilities compared to other tools.

Overall, the benchmarking activity highlights six different e-participation tools that could be candidates, pointing out that Decidim and GoVocal are the two most likely to be structured and adapted to the URBREATH Toolbox.

3 URBREATH methodology

This section introduces the URBREATH methodology, outlining its rationale, unique features, and the overall organisation of internal work. It then moves on to describe the collection of methods and tools employed in the project, focusing on two main components: internal co-creation sessions and the development of Local Living Labs. **Subsection 3.2.1** describes the specific methods and tools used during the internal co-creation sessions, while **subsection 3.2.2** focuses on the initial activities and methods implemented to establish Local Living Labs.

3.1 URBREATH methodological principles

The URBREATH methodology functions as a framework that integrates diverse methods, approaches, and tools, applied either independently or in combination depending on the specific activities and project phases. These activities are not inherently innovative, as they derive from established domains and prior experiments, particularly from other HORIZON Europe initiatives (European Commission, 2023). What distinguishes the URBREATH methodology is its unique design based on four core principles that together form an innovative approach to activity execution. The principles that set the URBREATH methodology apart from previously implemented projects are as follows:

- **Structure**: Flexible, Modular, and Scalable
- **Process:** Preparation, Development, Scaling, and Standardisation
- **Knowledge** flows: learning by doing, learning by interacting, and reflexive learning
- **Experimentation**: Cross-disciplinary and cross-scaling collaborations

Implementing these four principles in a comprehensive process benefits: (i) the relationships among FrontRunner and Follower Cities, combining different expertise and experiences, as well as the other 'non-city' partners engaged in the project; (ii) the relationships between public administration and urban planning departments with digital technology, enhanced and supported by the technical team within the consortium; and (iii) co-design and creative processes among decision and policy-makers, public officials, and citizens in practice, with processes and methods that emerged from this methodology. Overall, the URBREATH methodology is based on a comprehensive and integrated approach, where these four key elements are simultaneously applied in different workflows for various purposes[16].

[16] This chapter considers processes and activities from M1 (January 2024) to M13 (January 2025), specifically focusing on disentangling their peculiarities, the process, and the tools used in a progressive step storytelling. It also describes tools and methods that have been tested during this first year of the project to be validated within the second year and included in the further versions of the URBREATH Methodology (V2, December 2025; and V3; December 2026).

3.1.1 Structure: Flexible, Modular, and Scalable

The URBREATH methodology structure is founded on flexibility, modularity, and scalability. Given the URBREATH project's organisation with FrontRunner and Follower Cities, and different climatic zones, these principles are essential. They allow the methodology to be tailored to specific contextual characteristics, implemented in discrete steps, and scaled according to the varying needs and objectives across different contexts and activities (in this regard, see Deliverable D2.4 - Use Case Scenario and Baselines[17]).

The URBREATH methodology embodies **flexibility** through its adaptive framework of tools and methods that can be tailored to each city's specific context and needs. In general, it emphasises the adaptable use of these methods based on specific objectives while considering that different contexts entail a variety of institutional arrangements and organisations. This flexibility is especially important given the diverse nature of the cities involved in the project and their varying maturity levels in terms of NBS implementation, e-participation tools, urban planning regulations, and digital technology adoption.

For example, a method adapted for different purposes based on cities' maturity and project needs is stakeholder mapping. In the first phase, stakeholder mapping helps identify stakeholders (or users) affected by the URBREATH Toolbox (see D2.5 - URBREATH Platform Requirements). The insights gathered from city partners are shaped by their cultural and institutional contexts, which influence decision-making within their administrative and socio-economic environments. In the second phase, stakeholder mapping is used to identify potential stakeholders for the Local Living Labs experimentation. In both cases, the process is tailored to each city's unique characteristics, allowing for context-specific outputs (see **Section 3.2**).

The second aspect of the URBREATH methodology is its **modularity**, which enables a structured yet adaptable approach to its implementation. Modularity allows for the assessment of the maturity level of individual activities and processes, making it possible to refine, redesign, or enhance specific modules as needed. By treating methods and tools as distinct components within the overall framework, the methodology ensures that each step can serve multiple purposes. This means that a specific tool or method can be repositioned within the process while maintaining its integrity, allowing it to address different objectives effectively.

In the project, this is reflected in the ability to work on different steps of the process, as outlined in **Section 3.1.2**, and to adapt them based on each city's level of maturity. Additionally, these modules are

[17] According to the clustering in climatic zones, it is important to highlight that FrontRunner Cities and Follower Cities share similar natural hazards and challenges, which leads to similar use case scenarios. What differs, in this instance, is the institutional background and planning culture, which influence the possibility of implementing approaches, methods, and tools under general conditions. Having a flexible and scalable methodology could help in customising and adapting the processes for similar – but also different – purposes based on specific cities' needs.

cross-Work Packages, meaning they can be deployed at different stages of the process (e.g., a preparation and peer-to-peer learning workshop in early March vs. preparation and learning among non-city partners). While some modules are implemented by both FrontRunner and Follower Cities, certain steps require deeper analysis or validation to ensure alignment among all cities. For example, defining conditions and enablers—starting from each city's state of the art (see D2.4 - Use Case Scenarios and Baseline)—as well as from their data repositories, follows this approach. The methods and tools identified for the specific milestone in the process have been shared and co-designed with all the partners and cities involved; at the same time, in certain circumstances, some modules have been re-organised to allow each city and each partner to be aligned on the work (e.g., one-to-one meetings with cities to better identify specific information).

The last principle concerns the **scalability** of the methodology, which is crucial given the diverse nature of the cities participating in the project—FrontRunner and Follower Cities. Scalability means that the methodology is initially tested with FrontRunner Cities but can also be used by and with Follower Cities. Most activities include both FrontRunner and Follower Cities but with different degrees of interaction. Some workshops have been dedicated to FrontRunner Cities—since they are the ones deploying NBS in their pilots—while Follower Cities participate as an 'audience.' In other cases, activities are carried out in two phases: first in FrontRunner Cities and then in Follower Cities, but with a different level of detail. For instance, the implementation of the NBS in the pilot areas, and creation of the Local Living Labs and their steps are conducted in FrontRunner Cities, while Follower Cities focus on the preparation phase **Section 3.2.2**)[18].

As the project progresses, scalability will become more evident, particularly as FrontRunner Cities select and implement NBS in their pilot areas, while Follower Cities develop detailed plans for future implementation. This scalability enables activities carried out in FrontRunner Cities to be adapted and refined for Follower Cities, ensuring a flexible and transferable approach.

3.1.2 Process: Preparation, Development, Scaling, and Standardisation

The URBREATH methodology is structured into four distinct steps, each of which can be considered a standalone process. These steps guide the organisation of sessions, activities, and processes within the Consortium. The design and implementation of the methodology have been extensively and collaboratively co-designed, ensuring alignment with common objectives and the validation of partial results necessary for ongoing activities across different Work Packages (WPs). The four steps are jointly performed considering the three basic learning principles (see **Section 3.1.3**).

[18] It is important to highlight that Follower Cities are, however, participating in all the preparation steps for the creation of the Living Lab and will start considering further steps for replication based on the methods and processes that will be performed in the FrontRunner Cities.

Step one: Preparation. This step involves analysing best practices by gathering established co-creation methodologies and tools (e.g. ENoLL toolkit[19], SISCODE[20] and UnaLAB[21]) and preparing co-creation sessions. Developing specific processes that enhance co-design and co-production is crucial. The URBREATH methodology emphasises the integration of both city and non-city partners from the outset, incorporating diverse stakeholders into co-creative processes. The preparation step is essential for defining: (i) the overall design of the process, (ii) the potential and alternative methods to conduct the co-creation process, and (iii) the expected outputs. This step has been implemented in each work package individually—for example, WP2 analyses applicable co-creation methods and tools; WP3 and WP4 evaluate digital tools and existing technologies available on the market; WP5 focuses on best practices and existing models from Local Living Labs; and WP6 compiles comprehensive information on NBS and their features.

Step Two: Framework Development and Co-Creation Processes. This step involves a series of activities supported by materials and tools that facilitate discussions and co-creation processes. These processes are designed to collect information from work packages (WPs) and promote peer learning among FrontRunner and Follower Cities. To design this step, it is crucial to identify beforehand (in the 'preparation' step) the flow of the activities and the different expected outcomes and outputs for the specific sessions and activities. Equally important is the engagement of key stakeholders and participants who need to be part of the co-creation sessions. Therefore, alongside the preparation and framework design, a comprehensive mapping of all relevant stakeholders should be conducted to ensure their active participation in the co-creative processes.

Step Three: Knowledge creation and scaling deep/in/out. This step includes a set of activities related to the creation of a common language and vision towards NBS implementation and deployment, as well as all other essential outputs of the project. In this step, all cities are involved in the co-design process, allowing for peer-to-peer learning and self-assessment, which will be essential both for FrontRunner Cities implementing NBS in their selected pilot areas and for Follower Cities, which will have the opportunity to enrich their knowledge and start designing their approach towards future NBS development.
Furthermore, the co-creation process designed in Step 2 is closely related to continuous exchange among different partners: city-to-city exchange, as well as exchanges between 'non-city' partners and cities, and among 'non-city' partners themselves. This creation of knowledge is essential to establish a collective vision of the project and to develop specific and dedicated activities individually (at the stage of Tasks or Work Packages). The scaling deep/in/out enables the transfer of knowledge and enhances

[19] ENoLL toolkit with methods and tools: https://enoll.org/methods/ (Last access Feb. 2025).

[20] Siscode toolkit available here: https://siscodeproject.eu/wp-content/uploads/2019/09/toolkit-27092019-1.pdf (Last access: Feb. 2025).

[21] UnaLAB toolkit available here: https://unalab.enoll.org/ (Last access Feb. 2025).

the common ground and collective understanding of the processes and NBS implementation. Scaling the process and methodology is also essential to enhance and enrich the potential of the URBREATH methodology.

Step Four: Standardisation. This step represents the validation, re-organisation, and fine-tuning of all methods and tools to achieve optimal performance. It incorporates a generalisation process that identifies common features and similarities, ultimately providing a comprehensive instrument applicable to various contexts. This step embodies the core essence of the URBREATH Methodology, serving as a guideline for analogous processes in co-creation, citizen participation, NBS deployment and implementation, as well as the development of digital tools for urban decision-making, simulation, and social inclusion.

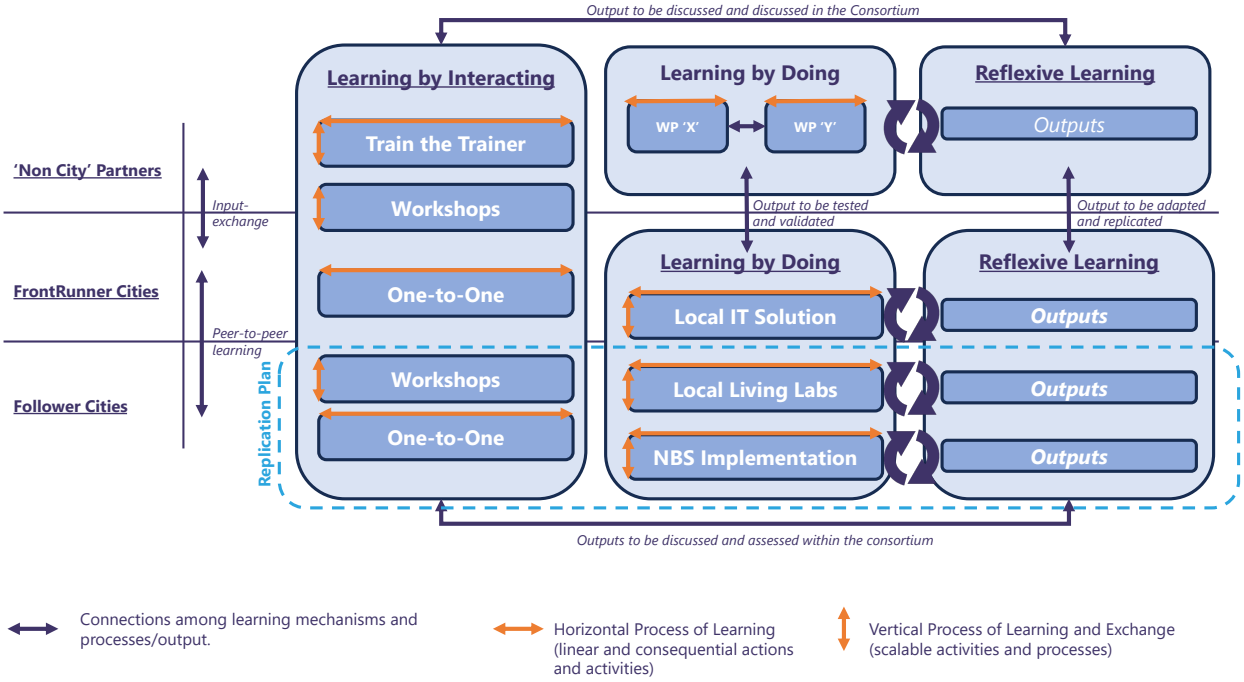
3.1.3 Knowledge flows: learning by doing, learning by interacting, and reflexive learning

The URBREATH methodology incorporates a set of knowledge-creation flows: the learning principles. These principles are essential for structuring the organisation and design of all activities and processes, and for producing original and adapted outputs from an educational and methodological perspective. The URBREATH methodology is based on three main learning mechanisms: (i) learning by doing; (ii) learning by interacting; and (iii) reflexive learning. Although these three principles could be associated with individual steps of the process, the learning methods adopted in URBREATH can occur at each step as a process of creation, validation, and finalisation. What is relevant is that the process combines creative and co-creative dynamics among different partners and their expertise across the Consortium. Figure 3 illustrates the interrelations among the three main learning mechanisms associated with the project,and their correlation within the process of understanding. The different arrows in orange can be summarised as follows:

- 'Horizontal process of learning': This indicates that the process is linear and related to the sequential actions of performing activities, collecting information, and executing tasks.
- 'Vertical process of learning: This pertains to the replicability and scalability of these processes, both from an internal perspective (e.g., interaction with stakeholders and user interface with the local IT platform) and the relationship between FrontRunner Cities and Follower Cities (which also considers the replication plan).

The blue arrows represent the information and outputs generated by the different learning mechanisms within the project, taking into account all the various stages and activities of the project.

Figure 3: The three learning principles in action. The actions performed through 'learning by doing' are also enriched by the 'learning by interacting' approach, and subsequently, both contribute to creating the basis for 'reflexive learning'.



Credits: Elaboration of the authors.

'Learning by doing' refers to the process through which the activities and tasks performed in the project generate knowledge. This concept aligns with John Forester's (1993) discussion on the combination and integration of technical/scientific knowledge and practical knowledge. While Forester's work specifically references urban planning, this principle can be applied across diverse domains. In real-world scenarios, practical knowledge becomes intertwined with scientific expertise and technical knowledge, collectively contributing to more effective outcomes.

More specifically, the production of knowledge among URBREATH partners (both city and non-city partners) takes shape through collaborative work where partners disentangle the tasks and activities needed to collect information from the cities. This learning-by-doing approach manifests as partners actively engage with real urban challenges, generating insights through direct experience. The co-creation process is related to a set of methods and tools (see **Section 3.2**), enabling structured discussion to design and produce specific outputs. This principle has been adopted in different steps of the project, namely:

- **Internal workshops** on baselines and scenarios (jointly organised within WP2 and WP5's activities), which guided cities to collect and discuss within their departments the challenges, opportunities, and expectations regarding NBS implementation, digital platforms for decision-making processes, and their needs in relation to the project's outcomes and goals.
- The **definition of pilot areas in the cities**, which will be further implemented and structured with the creation and design of the Local Living Labs and the actual implementation and deployment of NBS *in loco*.

The second principle, '**learning by interacting**,' means that both partners and cities benefit from the activities that are processed and organised and, at the same time, this interaction directly contributes to enriching knowledge and methods to perform relevant activities. The process of 'learning by interacting' is also related to the city exchanges and peer-to-peer learning organised throughout the process. This allows the 'non-city partners' to adjust questions and activities, including main objectives and issues that emerge from interactions in specific contexts.

These first two learning processes reflect the overall progress made during the first year, primarily by the cities and partners involved in various work packages (namely, WP2, WP4, and WP5)[22]. Furthermore, they are propaedeutic to the third learning process, related to 'reflexivity,' in the sense that cities and non-city partners also learn by reflecting on their own activities. Reflexive learning refers to a process that cities and 'non-city' partners might adopt in checking activities, targets, and objectives to better arrange them into doable tasks. At the same time, this process is crucial in assessing and fine-tuning the processes by which knowledge is created: communication, trial and error approach, follow-ups, and internal feedback are at the basis of reflexive learning, enabling and structuring activities, methods, and tools in a better way to be further pursued and used in the URBREATH project.

Reflexive learning s closely linked to both the replicability of certain tools and methods as proxies for identifying specific outputs and the need to adapt and refine investigations throughout the project, considering experimentation in FrontRunner Cities and its adaptation in Follower Cities. In this context, reflexivity refers to the methodology's ability to engage both FrontRunner Cities and Follower Cities with varying levels of activity and interaction (e.g., FRCs as active participants in specific sessions, and FLCs as 'audience' partners). This reflexive process allows Follower Cities to adopt the 'final version of

[22] These first two learning processes encompass the general advancement of work across different WPs, with specific reference to Task 2.4—Use Case Scenarios and Baseline (ref. Deliverable D2.4) and Task 2.5—URBREATH Platform Requirements (ref. Deliverable D2.5, released in December 2024). They also relate to activities in WP5 concerning the structure of the Local Living Labs (ref. Task 5.3—Local Living Labs), with a report to be delivered in June 2025 (Deliverable 5.5—Local Living Labs Report, V1). Additionally, they cover the analysis of the meso- and micro-scale (ref. Task 5.1—Analysis of the Local Baseline State and Task 5.2—Alignment of Requirements and Technical Solutions), which will be released in June 2025 (Deliverable D5.1—Local Baseline State and URBREATH Revisited Requirements and Technical Framework, V1). This process will be further detailed in Section 4 (see **Section 3.2**).

the methodology' (and replication models) based on FrontRunner Cities' learning experiences, enabling contextualisation, minimising risks, and optimising tasks and activities[23].

3.1.4 Experimentation: Cross-disciplinary and cross-scaling collaborations

Together with a flexible, modular, and scalable structure (Section 3.1.1), a four-step process (Section 3.1.2), and a set of knowledge flows (Section 3.1.3), the URBREATH methodology emphasises the experimentation of formats, methods, and tools across disciplines and application contexts. Experimentation in the project refers to a set of processes that have been 'tested' and validated throughout the project's first year. These processes specifically tackle three main elements that distinguish the URBREATH project, namely:

1. The integration of the methodology across **different scales (macro-meso-micro)**, with specific reference to information fine-tuning, generalisation, and customisation.
2. The **cross-Work Packages collaboration**, which introduces the co-creation and production of shared knowledge among different expertise.
3. The introduction of non-ordinary tools (e.g., Digital Twin or service design tools and service blueprinting) for urban planning decision-making processes (in this regard, see Caprari et al., 2022), with their integration and deployment.

Integration of the methodology across different scales. The URBREATH methodology structures its workstream around the relationships, transfer, and re-elaboration of information and data across three interconnected scales of detail: micro-scale (pilot cities), meso-scale (climatic zones), and macro-scale (generalised solutions). Throughout the project, information is processed and elaborated, moving from a local perspective (micro) to a more generalised approach (macro), while identifying common elements and dissimilarities across different climatic zones (meso).

The **micro-scale** level refers to individual cities and their pilot area. The micro-scale level includes all the information and details that are significant for the specific context and are influenced by the institutional constraints and settings embedded within cities. In this case, differently from the other two levels, the degree of information provides an extensive situation of the specificities of the pilot—and the city itself. Indeed, micro-scale is crucial in performing specific activities, for example, Local Living Labs.

The **meso-scale** captures information relevant to specific 'climatic zones'. It reveals common elements that help understand basic conditions across different urban contexts. These shared insights can be customised locally and also serve as generalised input for macro-level analysis. The 'meso-scale'

[23]As an assessment method, reflexive learning has played a key role up to M13 (January 2025) in evaluating activities, fine-tuning approaches, and shaping collective and joint tasks. In the next phase, it will further highlight cities' experiences and practices by focusing on two key aspects: (i) challenges and management methods in addressing urban planning issues and conflicts, and (ii) the evolving relationships between FRCs and FLCs.

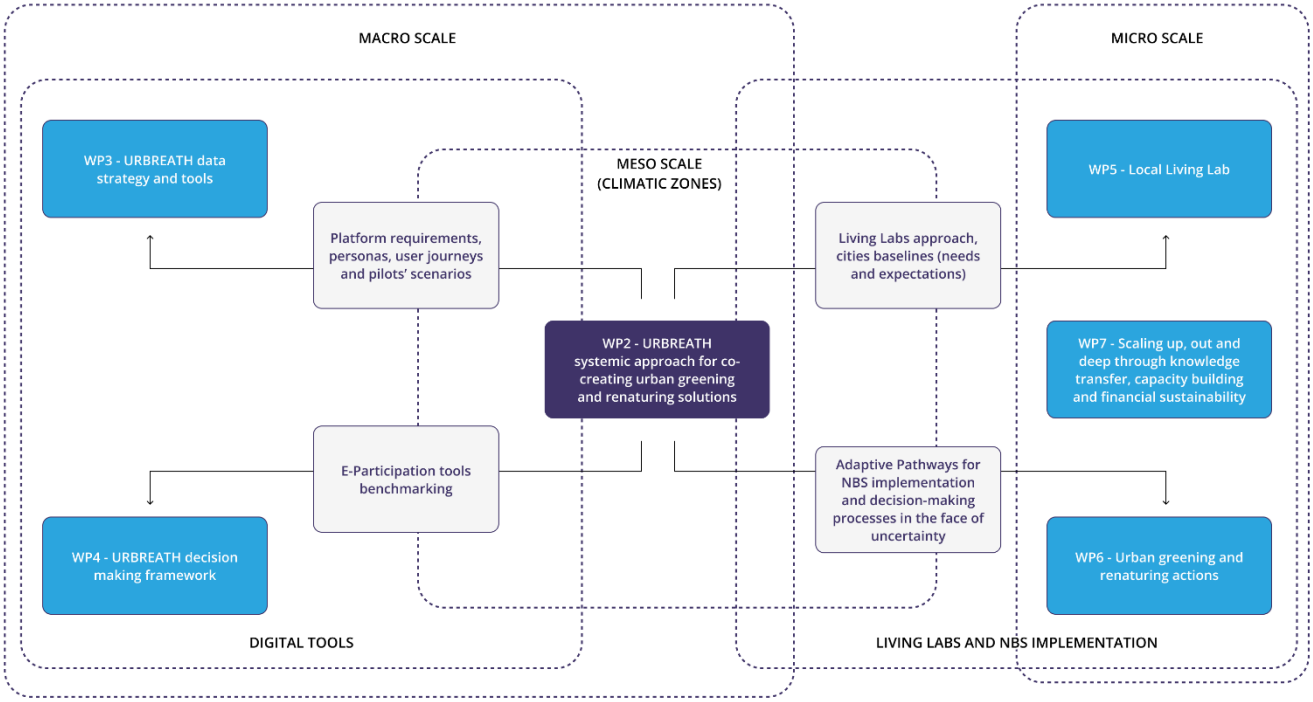
provides a crucial operational level for selecting and linking similar planning practices by highlighting key contextual aspects. In the URBREATH process, for instance, considering NBS deployment through a climatic zone lens is essential, as many interventions depend on specific natural and climatic conditions. The **macro-scale** is where information is generalised and becomes applicable to all cities and partners. At this level, data collected through various methods and tools is characterised by a degree of generalisation that allows it to be applied across different contexts. This work is primarily done within the methodological framework, enabling both generalisation and scaling in/out. For example, the URBREATH methodology is designed for use within the project but must also ensure adaptability and flexibility for other contexts and projects[24]. The macro scale is where all information and processes are structured to be potentially used by both Frontrunner and Follower Cities (e.g., as outlined in Deliverable D2.5 - URBREATH Platform Requirements).

The three scales are essential for two key reasons. First, operating at different scales enables a comprehensive understanding of the phenomenon's granularity. This approach spans from the European scale (macro), which allows for generalisation of outputs, to local contexts (micro) that highlight the heterogeneity and specificity of individual places and cities. The 'Climatic Zone' scale (meso) bridges these perspectives by revealing commonalities across cities located in similar climatic regions, uncovering shared needs, expectations, and requirements generated by comparable planning cultures, institutional organisations, and climatic conditions. Second, this multi-scale approach is dynamic and iterative. The subdivision can be continuously updated and reviewed, with information flowing both top-down (from macro to micro levels) and bottom-up (from micro to macro levels). This bidirectional knowledge transfer ensures a comprehensive and adaptive methodology that captures both broad patterns and local nuances.

Figure 4 illustrates the interconnections among the different WPs and their relationships with the scales. It shows how all WPs engage with the three different scales, conducting diverse activities based on the required output. It is important to note that activities and tasks designed at the micro-scale (focused on the pilot or city level) will primarily be re-elaborated and integrated into the macro-scale (National or European). This process ensures that the detailed local experiences are maintained while making the outputs applicable to broader realities and contexts. At the same time, it is important to emphasise that this network of activities and relationships is carried out simultaneously across different Work Packagess, while fostering collaboration among them. All activities implemented adopt co-creation and co-design approaches that span across tasks and work packages throughout the project.

[24] This macro scale is applied to the context of the project, but considering also the replicability and standardisation step, the macro scale will also consdider a broader variety of Cities.

Figure 4: Flowchart and presentation of the Work Packages and their relation to the three scales.



Credits: Elaboration of the authors.

Considering the overall URBREATH project, in which Frontrunner Cities and Follower Cities will deploy NBS in specific pilot areas based on identified needs, challenges, and use cases (see Deliverable D2.4 – Use Case Scenarios and Baselines), the three levels play a crucial role. They help derive general mechanisms, dynamics, and activities at a broader scale (macro), refine and channel shared characteristics (meso), and tailor information to specific pilot areas (micro)—and vice versa.
At the same time, insights from pilots' baselines and use cases in Deliverable D2.4 - Use Case Scenarios and Baselines (micro-scale) have been analysed and translated into technical requirements. Local requirements were defined by integrating both the micro-scale of pilot areas and the macro scale needed to design and draft the general and initial requirements of the URBREATH Toolbox (for the general requirements, see Deliverable D2.5 – URBREATH Platform Requirements).

Cross-Work Packages Collaboration. The experimentation at three different scales is essential for the composition of the URBREATH methodology, as well as for the internal organisation of the Consortium among WPs and related Tasks. To recall the structure of the project and its WPs, there are three main scales from which the project would provide innovative and creative solutions:

- Macro scale, which relates to the general background and methodology (WP2). It also includes the common elements, requirements, and needs all the pilots have highlighted in employing the URBREATH Toolbox (outlined by WP3 and WP4).

- Meso scale, which includes—from a climatic zone perspective—the similarities of needs and expectations of NBS implementation, and highlights commonalities among planning cultures. It also emphasises the dissimilarities among the different pilot areas and use case scenarios, clustering them into specific and context-related issues linked with natural hazards.
- Micro-scale, which allows 'bridging the gap' between the general requirements of the URBREATH Toolbox (macro scale) and the pilot areas (WP5), with specific reference to the context where these pilot areas are positioned (micro scale).

As the three scales correspond to specific WPs within the project, the cross-Work Packages collaboration was intended to be one of the first approaches in the project to be tested. This internal collaboration among the different WPs is essential to ensure three main elements within the project[25].

Integration of methods and tools from heterogeneous disciplines. Along with the integrated approach across different scales and the cross-collaboration among WPs, another key aspect of the URBREATH experimentation is the combination of diverse methods and tools, typically used within specific domains (e.g., digital tools and ICT, co-creation and participatory processes, workshops, learning sessions). In this context, these methods and tools are adapted and integrated into the urban planning process. For example, in the implementation of NBS, the traditional local decision-making process is strictly tied to urban planning. However, tools like service blueprints (adapted from service design) and specific data collection for defining URBREATH Toolbox requirements (a practice rooted in ICT) are not part of mainstream urban planning. Instead, these approaches have been used to define, validate, and establish the foundations for city development: (i) NBS in the pilot area and (ii) e-participation and urban simulation solutions in their respective contexts (e.g., Digital Twin).
Cross-domain integration of methods and tools is essential for two main reasons. First, it reflects the inherent heterogeneity of the URBREATH consortium, which brings together diverse expertise from various professional and academic domains, including urban planning and design, ICT and digital technologies, public administration and governance, and participatory design. Second, the project's effort to experiment with domain-specific methods demonstrates its commitment to breaking down

[25]First of all, having a **general and shared collection of information and expertise at an early stage** contributes to set all the activities organised jointly among the different WPs. This cross collaboration among WPs is operationalised and embedded in the URBREATH project with the weekly updates where all the WP leaders from WP2-WP4-WP5-WP6 and WP7 meet to define and arrange tasks and activities to be performed along the project.
This joint activity and discussion leads to the second essential element of the collaboration which is the **externalisation** of the tasks along the whole consortium. This activity entails primarily the engagement of cities in a stage where all the activities are decided and jointly organised by the WPs. Once the tasks, the objectives and the output are set, the co-creation 'knowledge' process between cities and WPs is performed. This production of data serves as the basis for all WPs involved in the joint tasks to have a clear overview with different levels of understanding, highlighting the importance of the three scales above mentioned. The third step of the cross-collaboration and co-creation is related to the **presentation of the output** as a way to validate and to fine-tune the information provided by cities. This last element is essential for two main reasons: on the one hand, it emphasises the role of being aligned with cities needs and expectations; on the other hand, it relies on contextual experiences, which contribute to having a project that has more chance to be scaled in/deep/out.

silos in NBS implementation. By leveraging methods from different fields, URBREATH seeks to enhance processes, foster citizen interaction, and strengthen co-creation dynamics. The integration of different tools opens up the possibility of developing replicable processes in other contexts, as well as serving as an alternative way of considering urban practices and urban processes.

3.2 URBREATH methodology: collection of methods and tools

After considering the inspiring principles of the URBREATH methodology, the following section outlines the methods, formats, and tools employed in the project so far. As previously mentioned, the innovation in the URBREATH methodology lies in the combination of various methods and tools, primarily adapted from the service design domain, to deliver a blueprint for the implementation and use of the URBREATH Toolbox[26].

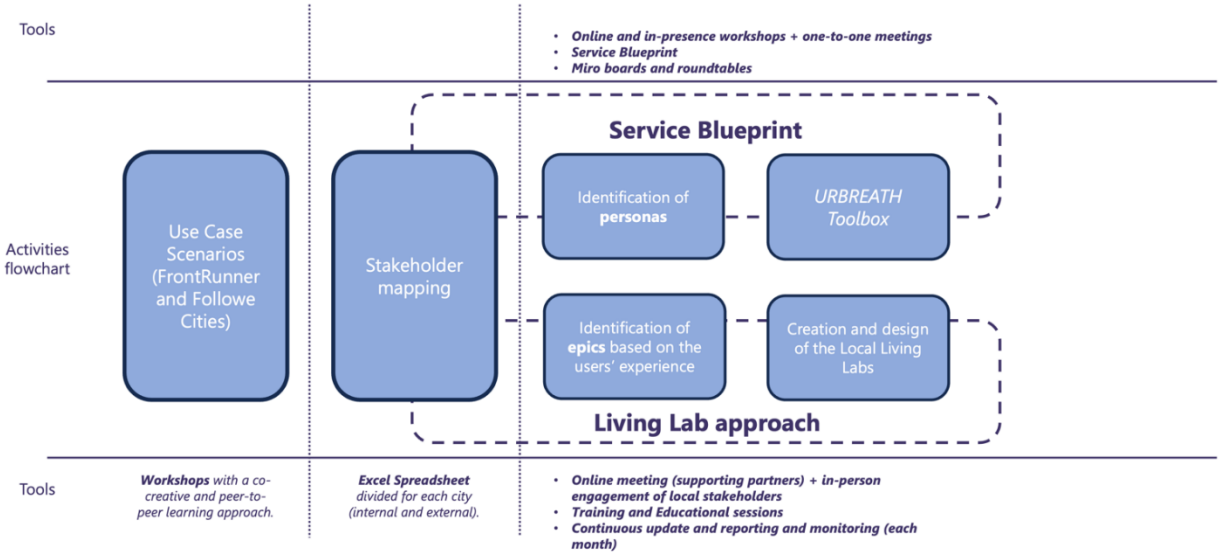
The framework used to define and design the project activities is largely based on mainstream service design methods, particularly service blueprinting (SB). Originally introduced by Shostack (1982, 1984), SB is frequently used to design and manage service processes and products (Kostopoulos et al., 2012). Service blueprinting presents a certain level of complexity, which mirrors the complexity that different urban agents perform in cities. On the one hand, the interconnections and sequential steps required to deliver a service are intricate; on the other, the degree of interaction and flexibility within each step is crucial in shaping the process (Shostack, 1987).

Building on these principles, the URBREATH methodology operates within a highly complex framework, involving multiple steps and numerous interactions among partners, which are essential for learning methods, and for setting up milestones and intermediate objectives to monitor the workstream along the project. However, this continuous and structured collaboration—along with the high level of knowledge exchange and co-creation—enriches the approach, making it both dynamic and effective.

For this purpose, this first release of the deliverable is intended to extensively describe the process, with the specific tools and methods adopted in the single activities. It is essential to highlight that all tools and methods that have been employed and utilised in the steps and across the first year of the project might be considered a 'testing' to be validated within the second year of the project. This exercise is crucial in delivering replicable tools to be used for different purposes and in different contexts. Figure 5 shows conceptually some of the main steps that the URBREATH project has taken across its first year, with a set of key 'operational' tools that enable the production of specific outcomes.

[26]In addition to deploying diverse methods and tools, it is essential to highlight the role of enabling devices in this process. These include both online and offline activities (e.g., presentations, offline information collection, targeted meetings) as well as in-person activities (e.g., workshops, partner exchanges, and training sessions).

Figure 5: Design process focused on key steps of the process, and methods and tools that are tested and experimented in approaching URBREATH digital tools and Local Living Labs organisation.



Credits: Elaboration of the authors.

This flowchart is essential in understanding how multiple methods and tools have been applied to perform and assess specific outcomes (e.g., stakeholder mapping as the basis to design the service blueprint; or to start an initial scoping of the potential stakeholders interested in being part of the Local Living Labs). All these methods have been integrated into different steps across the project, to co-produce knowledge and assess objectives. Briefly:

- '**Workshop**' aims to create an interactive discussion on specific topics (for more details, see Section 3.2.1). They are prepared and organised following a specific structure, which, most of the time, follows the Cities' Climatic Zone clusterisation. They also enable open discussion and peer-to-peer learning among the different cities—both FrontRunner and Follower of the same Climatic Zone and from different ones. Workshops foresee a specific output to achieve within the session in order to have the possibility to elaborate and fine-tune evidence and information for the next activity/step. These sessions are also described as 'co-creation sessions' as the outcome of the activities leads to a co-created product, both from a collaborative Work Package activity and from the Cities' perspective—with all the information provided in the first place[27].
- '**One-to-one**' meetings are specific sessions with cities aimed at fine-tuning and customising the information provided within the workshops, with specific reference to all the details that are unique to the context. While the main objective of the workshops is to co-create knowledge and to 'standardise' the process and common elements, the aim of the 'one-to-one' meetings is to

[27] The different workshops are oriented towards the learning principles identified in Section 3.1.3.

specify and contextualise a specific output from the workshop into tailored solutions and processes. There are cases where these individual meetings with cities are organised both in FrontRunner and Follower Cities; but other cases (e.g., those for the implementation of the NBS) where priority is given to the FrontRunner.

- **'Train the Trainer'** sessions are specifically related to the process of learning, which aims to educate and train cities and 'non-city partners' on specific topics. These sessions are crucial for presenting some of the key outputs derived from specific activities and enabling partners who were not directly involved to gain a detailed overview of outcomes, findings, and information to further the implementation of the project. In some instances, the sessions include the presentation of the adopted framework, while in others, they are more focused on practical outputs to be employed in various activities.
- '**Service Blueprint**' is a specific tool used to understand the production of a specific service (e.g., the URBREATH Toolbox, see Deliverable D2.5 - URBREATH Platform Requirements; or the URBREATH Methodology itself) highlights the relationships and interactions among different components of the service, such as information, users, and devices. This tool helps in defining a structure, as well as a workstream that can be easily displayed and visualised. At the same time, it allows the identification of 'weak' points, which serve as a basis for any further collaborative activity (e.g., workshop or one-to-one). It also empathises with the role of the user and their experiences.

Within this general aim, the URBREATH project methodology consists of two main formats: internal co-creation sessions (**Section 3.2.1**) and the approach, tools, and methods used for the Local Living Labs preparation (**Section 3.2.2**). The co-creation sessions are collaborative design moments that involve the project's internal partners, with the main objective of aligning intentions among diverse partners and defining use cases and requirements for the URBREATH platform. The Local Living Labs are open innovation ecosystems where users, researchers, businesses, and public bodies collaborate to co-create, prototype, and test new solutions in real-life environments.

Figure 6: Design process for the URBREATH Toolbox, showing the integration of macro, meso, and micro-scale inputs—from stakeholder identification and user journeys to local requirements and scenario prioritisation—leading to the initial design.

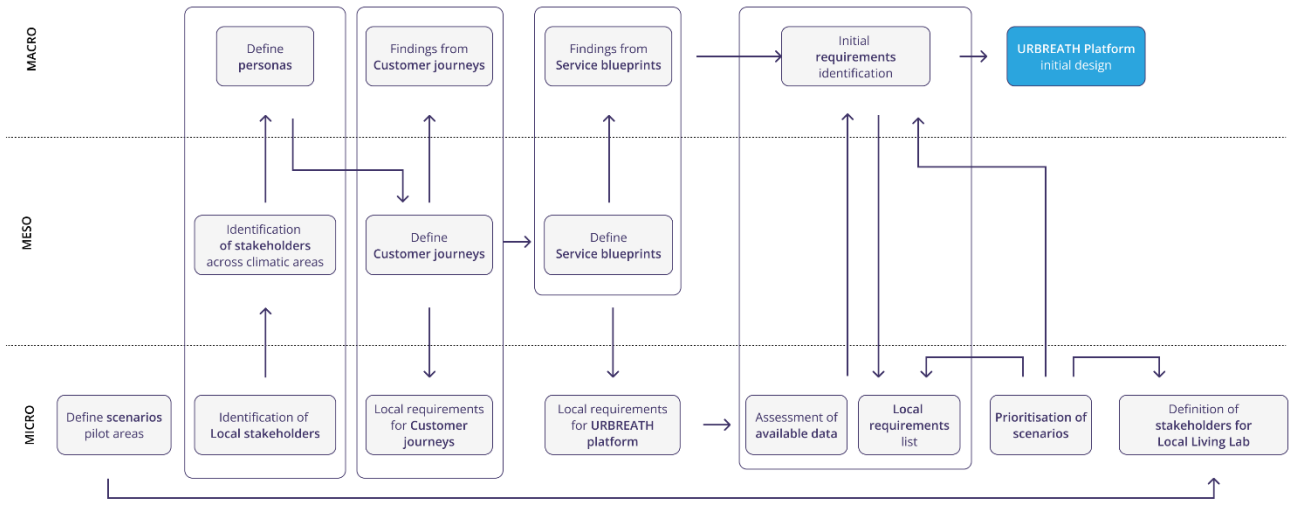


Figure 6: Credits: Elaboration of the authors.

3.2.1 Internal co-creation sessions

Co-creation and co-design have been at the forefront of numerous urban development processes. They highlight the importance of planning with cities and people (De Carlo, 2005) to enrich decision-making processes and ground urban development in specific local contexts, taking into account heterogeneous needs. The trend towards participation and civic engagement as a key factor of urban development has gradually increased since the early 2000s, when governments across Europe started boosting these initiatives to enhance decision-making processes. Including citizens in participatory processes increases the level of efficacy, quality, and transparency of certain planning decisions that might affect the community (see Mariani et al., 2023).

Co-creation processes are often linked to 'place-making' methods (see Jacobs, 1961; Lynch, 1960). This perspective is crucial for integrating co-creation into urban transformations, particularly in civic participation and collaborative, communicative planning—key foundations of this approach (see Habermas, 1985; Forester, 1980, 1982). While civic participation and stakeholder engagement are well-established concepts in urban planning, it is important to note that 'participation' is only one component of a co-creative process (see Meetiyagoda et al., 2024).

Considering co-creation from a practical and operational point of view, co-design is a complex process. The need to engage communities in decision-making processes is frequently considered a key aspect of achieving more successful and inclusive urban planning processes. While co-design processes can foster democratic engagement and innovation, they are also susceptible to challenges such as power

imbalances and resource constraints (Sanders and Stappers, 2008). The idea of co-creation as 'making something together' (Puerari et al., 2018) is associated with having individuals participate together in addressing urban development issues, giving them a sense of awareness and responsibility. It also relates to tackling urban (and other kinds of) challenges and designing and implementing a collective and preferred solution (Bryson et al., 2017). Furthermore, co-creation and innovation are more likely to happen when individuals and stakeholders are directly involved in activities that are strictly connected and influenced by the context and the built environment (Thompson and Prokopy, 2016). Co-creation processes risk becoming rigid procedures that diminish their potential, devolving into symbolic participation that fails to shift decision-making power (Kelty, 2020). Critics also note that participatory processes often privilege dominant stakeholder voices, leaving marginalised communities sidelined and their unique perspectives unaddressed. Drawing on Arnstein's classic critique of citizen participation (1969), it is noteworthy that without deliberate, power-redistributive mechanisms, participatory processes risk reinforcing existing inequities rather than challenging them.
Within URBREATH, co-creation sessions utilise a range of methods and tools, each designed to achieve specific objectives. These activities are conducted sequentially, with the output of one activity typically serving as input for the next. While not all activities involve all partners simultaneously, each brings together different combinations of partners depending on its specific objective. The section below describes the activities conducted, methods and tools used, and results achieved.

City-to-city exchange sessions: Kick-off

The first activity aims to facilitate knowledge sharing among cities, focusing on their needs and expectations. Partner cities are grouped into the four Climatic Zones (i.e., Mediterranean, Atlantic, Boreal, and Continental). Each Frontrunner and Follower City is allocated time to discuss and present its pilot using a standardised template co-created by all partners. This city-to-city exchange was organised early in the project, one month after the Kick-off Meeting (March 2024).

Objective: The goal of this activity is to conduct a preliminary analysis of cities' needs and expectations, and to check their advancement on the pilot area selection.

Tools and process**:** City representatives share their needs and expectations for the project through online sessions, grouped by climatic zones. Cities present their current state to assess maturity levels in crucial URBREATH project elements (including urban planning and regulation tools, nature-based solutions implementation, and digital platforms for co-creation and civic participation). To perform this activity, the main tools are a collaborative online board and a slide deck template. Each city representative presents their case study following a provided format, covering needs, expectations, proposed NBS testing locations, and existing digital infrastructure. As cities present, moderators capture key elements on an interactive board, clustering them by topic.

Outcomes: Following the sessions, moderators compile the clustered information from the online board into written reports, one for each climatic area. These reports, shared with all project partners, provide a synthetic overview of the baseline conditions, needs, and expectations for each climatic area, along with identified problems and opportunities. This report allows for an initial investigation of the local baseline of the cities, as well as the common elements (at macro and meso-scale) and the local peculiarities (micro-scale). This initial mapping is further refined through a stakeholder mapping activity, which identifies key stakeholders for each city's planned NBS implementation.

Stakeholder mapping, personas and users

After the initial city-to-city exchanges, which focus on sharing general information, cities engage in a more structured activity to deepen their stakeholder analysis. The goal is to leverage their knowledge to compare their respective situations and identify commonalities within and across climatic zones. Additionally, stakeholder mapping provides an overview of potential stakeholders who may be involved in or interested in implementing NBS in the pilot area, while also considering potential users of the URBREATH Toolbox.

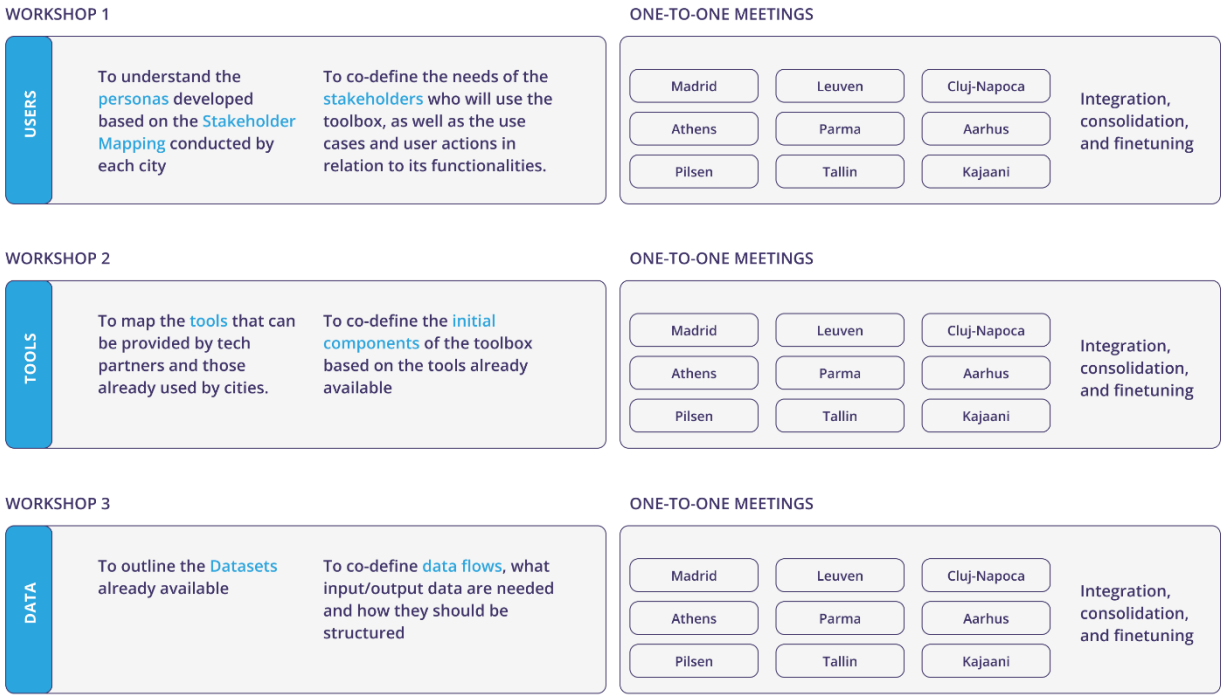
Objective: The goal of this activity is to perform an analysis of the key stakeholders involved in NBS implementation and in urban planning decision-making across cities and climatic areas. During this activity, cities outline relevant stakeholders, their needs, and potential gains from the URBREATH Toolbox.

Tools and Process: In addition to city-to-city exchanges, each city compiled a document outlining a set of stakeholders. This document, a shared spreadsheet, requires cities to list relevant NBS stakeholders, their roles, and their specific interests in NBS implementation. Each city has a designated section to identify key stakeholders based on their nature—whether internal or external to the municipality—and their current level of engagement in the NBS domain. This initial information is further refined by assessing the opportunities and challenges each stakeholder faces. Once all data has been collected, stakeholders are analysed using an adapted version of the Pain-Gain-Pain Relievers method, originally developed as part of the Value Proposition Canvas by Strategyzer. This approach helps cities identify key challenges (pains), desired benefits (gains), and potential solutions (pain relievers) for each stakeholder. At a later stage, the information collected through this document is summarised, and by identifying commonalities among cities, archetypal users (personas) are generated.

Outcomes**:** The stakeholder mapping produces a set of personas—fictional characters that represent specific user segments. For URBREATH, **six personas** are derived from the stakeholder mapping activity: Urban Planner & Policy Maker; Community Leader & NGO Representative; Real Estate Developer and Investor; Local Government Official; Tech Specialist and Technology Developer/Data Analyst; Citizen. The six personas are the result of a detailed analysis of all the stakeholders identified by Frontrunner

Cities and Follower Cities, which have been clustered based on common traits (e.g., similar gains; similar description of the actor).

Figure 7: Overview of the three URBREATH workshops aimed at co-defining user needs, technical tools, and data flows through collaborative sessions with city partners and one-to-one meetings.



Credits: Elaboration of the authors.

First Composition of Local Living Labs

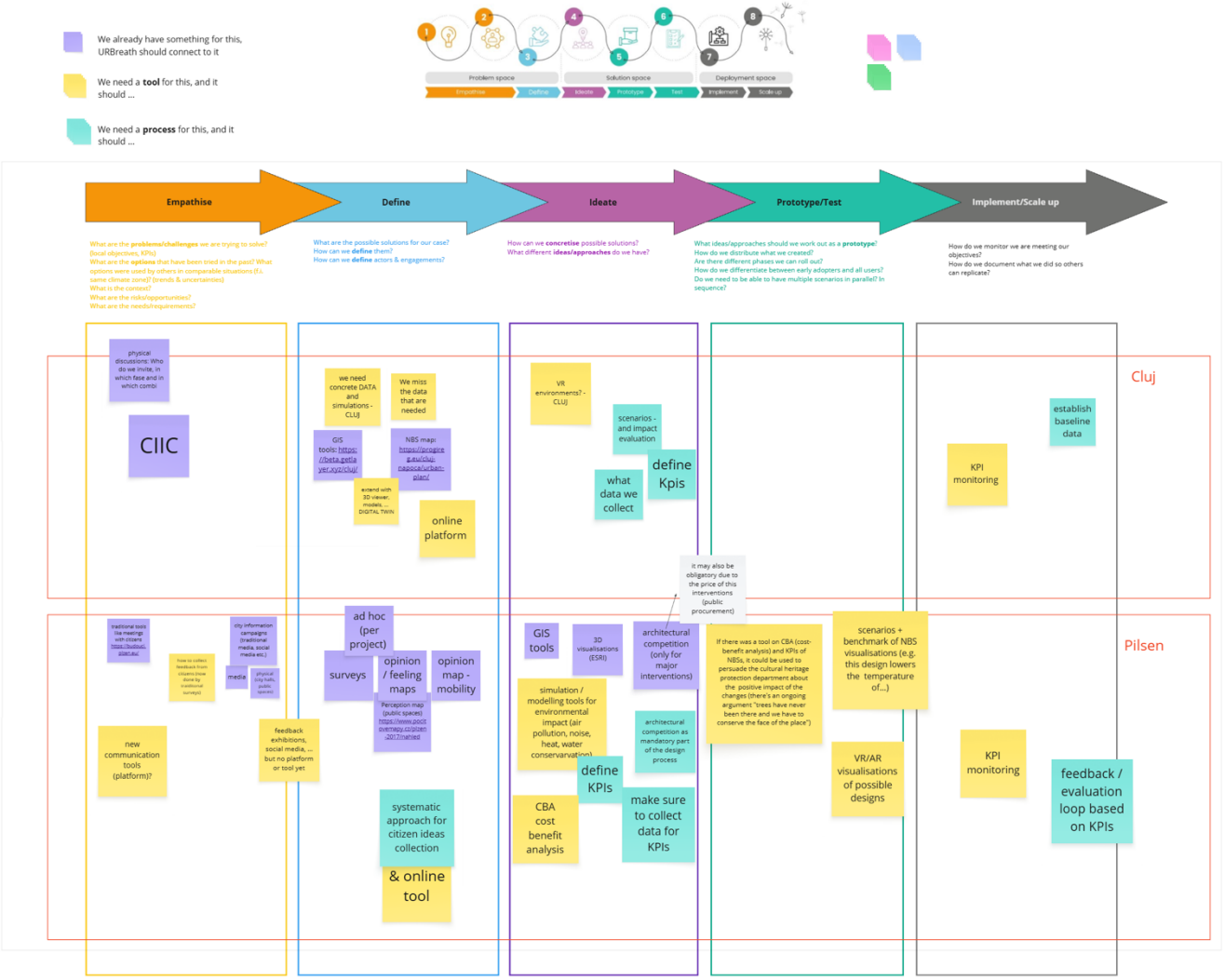
These initial rounds of meetings were conducted in parallel with the stakeholder mapping activities. The first step of the mapping activity (i.e., defining interested stakeholders, their opportunities, and challenges) also serves as a strong basis for investigating the organisation and design of the Local Living Labs. The workshops were organised based on the Climatic Zone clusters and aimed at discussing the pilot sites of each city.

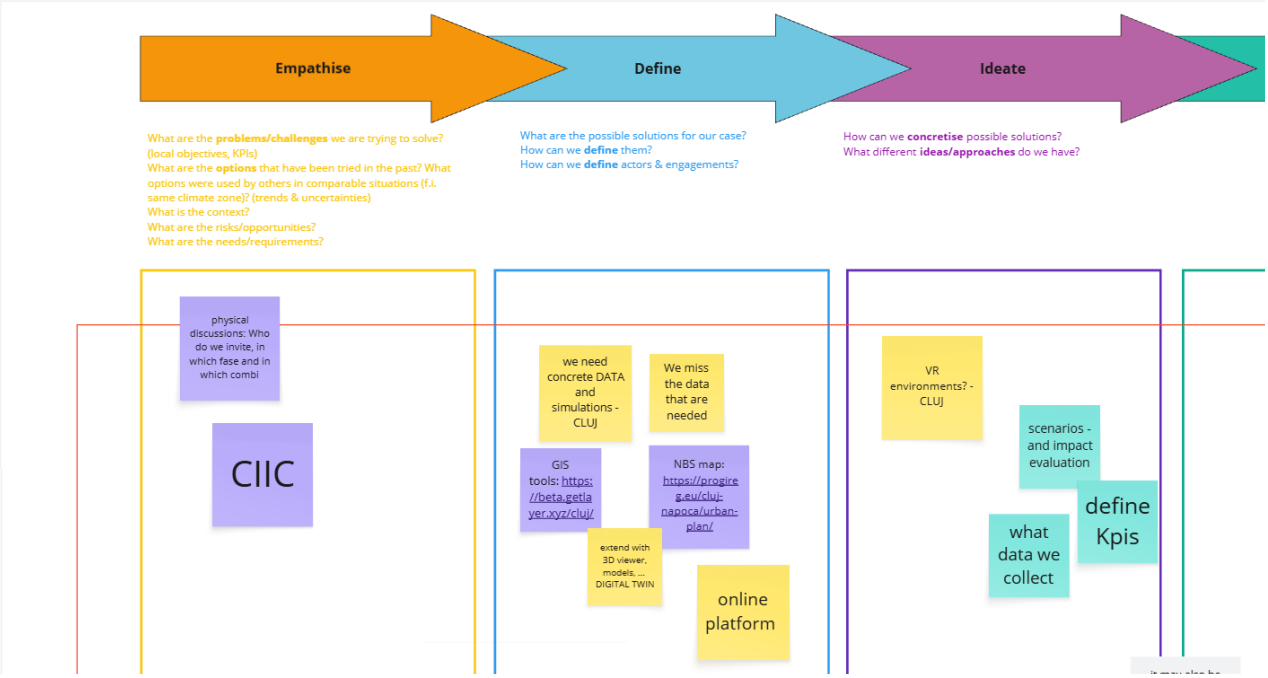
Objective: The goal of this activity was to define pilot-specific functional and technical requirements. As a basis, the pilot-specific use cases were defined in the City-to-City Exchange, as presented by the pilots during the kick-off meeting in Leuven in February 2024. Additionally, -City Exchange, as presented by the pilots during the kick-off meeting in Leuven in February 2024. Additionally, an initial monitoring of the 'as-is' and 'to-be' status of the Local Living Labs (LLL) for each pilot was conducted as part of the empathise phase (define and understand, see **Section 3.2.2**) of the LLL timeline.

Tools and process: An interactive, participative post-it MIRO board exercise was organised. During the first half of the workshop, we identified the 'as-is' and 'to-be' status of the Local Living Labs. The cities mapped the different roles within the Living Lab, its composition, the involved parties, the existing tools, and the stakeholders involved in the different steps of the pilots' use cases. During the second half of the workshop, the focus was on identifying the tools and functionalities/processes needed for each pilot. Using different colours of post-its, we determined what was available and what was needed, differentiating between tools and processes for all stages of the project (from empathise to deployment).

Outcome: This discussion provided an initial understanding of the Local Living Lab status and the availability, expectations, and needs concerning tools, processes, and functionalities for each stage of the pilots' use cases connected to the URBREATH project. In the following weeks, the data were analysed and processed. Feedback was grouped and mapped on a time scale. The results formed the basis for the second workshop.

Figure 8: MIRO-board exercise for the Boreal Climatic zone unveiling needs and availabilities for tools, processes and functionalities for pilot use cases during the different stages of the URBREATH project. (Figure 8a shows the Miro Board used to guide the discussion with the Cities in the Continental Climatic Zone about availability of tools, processes and functionalities to be implemented at the local level for the URBREATH platform requirements; while Figure 8b focuses on the first three steps ('empathise', 'define', and 'ideate') of the process of analysis, which is linked with the Living Labs activities).





Credits: Elaboration from WP5.

User Journey Mapping and Touchpoints

This session aims to further develop the design of the URBREATH Toolbox by defining potential use cases based on the personas identified in the previous step. The workshop is structured around the detailed description of these personas and their key characteristics, guiding cities in exploring specific scenarios where a potential user could interact with the URBREATH Toolbox.

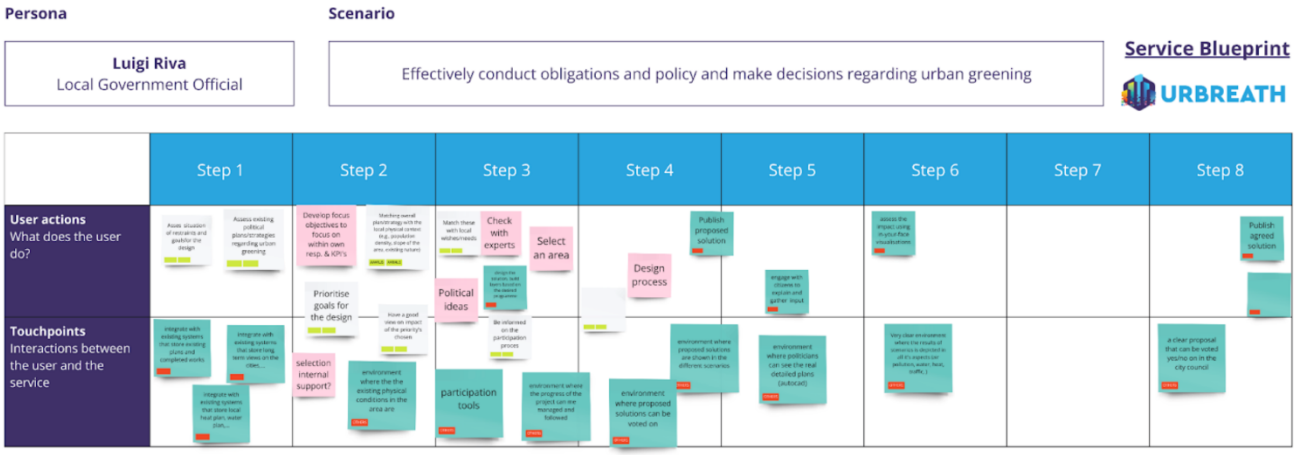
Objective: The goal is to collaboratively identify use cases for the URBREATH Toolbox based on the previously defined personas. City stakeholders participate in interactive sessions to explore potential use cases. Working in groups organised by climatic zones and guided by moderators, participants develop user journeys for different personas. Each Climatic Zone is assigned three personas, with the task of completing at least two user journeys. Participants are assigned to specific rooms based on their expertise (e.g., one technical partner and one operational partner per breakout room).

Tools and process: A collaborative online MIRO board featuring a user journey map, which visualises the steps users take when interacting with the system to achieve specific goals. The map tracks touchpoints—specific moments of interaction between users and the service, such as geographic representations, lists, apps, digital twins, or e-participation platform features. In addition, participants receive a document in advance with a detailed description of the different personas. Groups select two personas from three options and complete the user journey map by first writing a specific scenario and then identifying relevant touchpoints.

Outcomes: A collection of detailed use case scenarios (related to the digital platform) defining user journeys for the assigned personas, specific to each climatic area.

Figure 9: Service Blueprint used for designing the user journey.

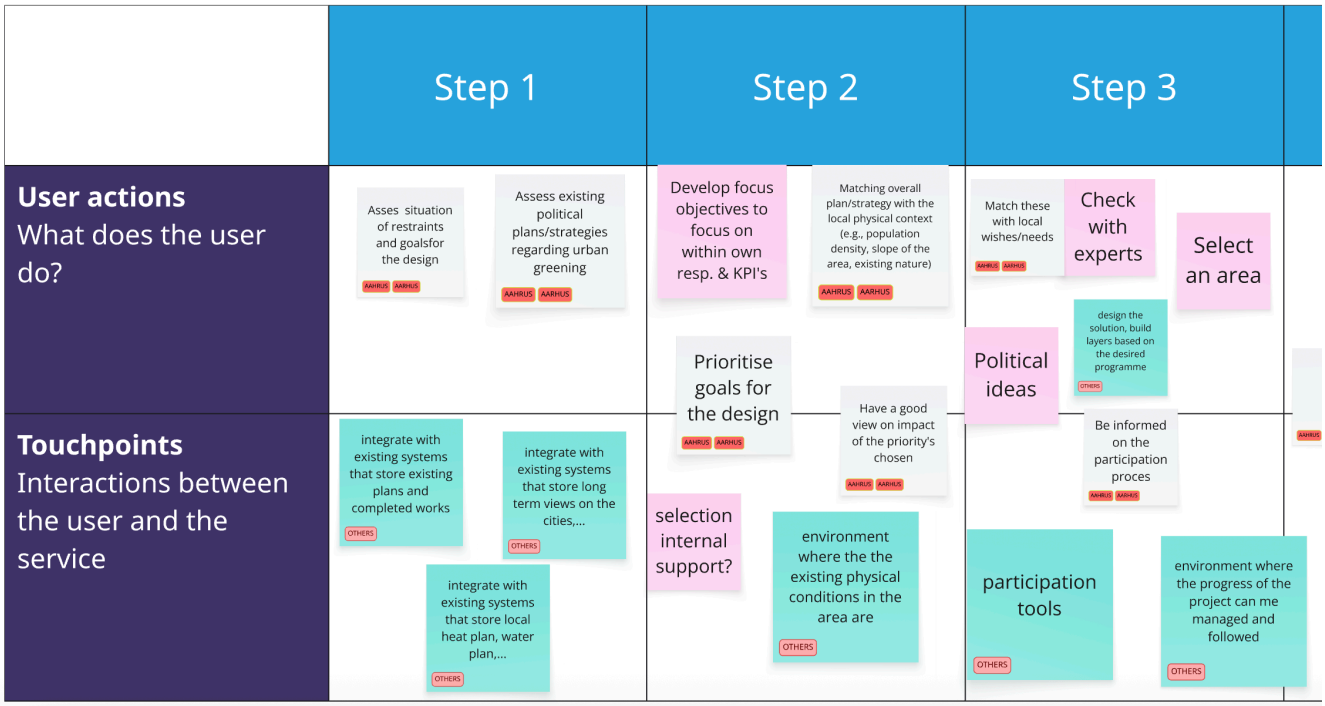
Figure 9a shows the first two blocks of the Service Blueprint' which also identify personas with specific scenarios - selected by the cities - related to a hypothetical digital solution. Cities are asked to consider the potential activities that the users must perform; Figure 9b focuses on the first three steps of Service Blueprint and User Journey for the specific persona 'Local Government Official' described by the Climatic Zone.



Source: Miro Board, URBREATH. Atlantic Zone (available here).

Persona

Luigi Riva
Local Government Official



Source: Miro Board, URBREATH. Atlantic Zone (available here).

Users and Users' Stories

The one-to-one meetings organised for each city aim to refine the description of users and their engagement with the potential local digital platform. Specifically, these nine meetings provide an in-depth understanding of the features and user stories[28] behind each defined use case scenario, allowing for the customisation of users based on the specific requirements of each city. Unlike the workshops,

[28] A 'user story' can be described by Cohn (2004) as "a user story is written to describe functionality that will be valuable to either a user or purchaser of the application." It is a simple description of a functionality or a feature of a platform/service told from the user's perspective (who ideally desires new functionalities or capabilities).
An example of a user story follows this structure: as 'who', I want 'goal to be delivered', so that 'reason'. An example taken from the exercise is: "As a 'pilot', I want to 'be able to use existing datasets and models, to use in the what-if analysis', so I can 'reuse what is already available'." Another example is: "As a 'LL user', I want to 'use specialised tools that help me to participate and co-create', so I can 'contribute to the LL'."

the one-to-one meetings enable a more detailed exploration of each city's unique requirements and needs, building on the collective work carried out during the user workshop.

Objective: The goal is to develop city-specific user stories and epics[29] based on the collective work on use cases and potential scenarios in which users interact with the platform. This approach ensures that user customisation for different cities bridges the gap between the broader macro and meso scales of the URBREATH Toolbox, making it more adaptable and tailored to the specific users within each city's context.

Tools and process: A presentation explaining the basic concept of the Local Living Labs in relation to the kind of users—or stakeholders—that are needed. An interactive canvas following the structure and steps of the creation for the Living Labs enables the discussion on users from the different cities and the features they expect from the Local Living Lab approach and the local platform interface. The discussion follows the different steps (as reference, see Mastelic, 2019).

Outcomes: These sessions provide a general overview of 'micro' actions and 'micro' scenarios based on the needs and expectations each city has.

URBREATH Digital Tools

This workshop is devoted to presenting the available tools that could help define the functionalities of the URBREATH toolbox. It follows the first workshop about the 'users', consisting of a plenary session and the division of cities and partners into Climatic Zones Breakout Rooms. In this case, the plenary session illustrates the different categories of candidate digital tools and their purposes. Building on the work done in the first workshop about 'users', the 'tools' session focuses on the third line of the service blueprint: 'functionalities'.

Objective: To map the tools that can be offered by tech partners and those already used by cities, and to collaboratively define the functionalities of the URBREATH toolbox. In the interactive session, participants—grouped by climatic areas—are tasked with matching touchpoints in the user journey maps (defined in the user journey mapping session) with the desired functionalities of the URBREATH toolbox. In other words, each step of a user journey map is enriched with ideas for possible functionalities that the URBREATH toolbox could provide to support that step.

Tools and Process: The activity is structured in two main phases:

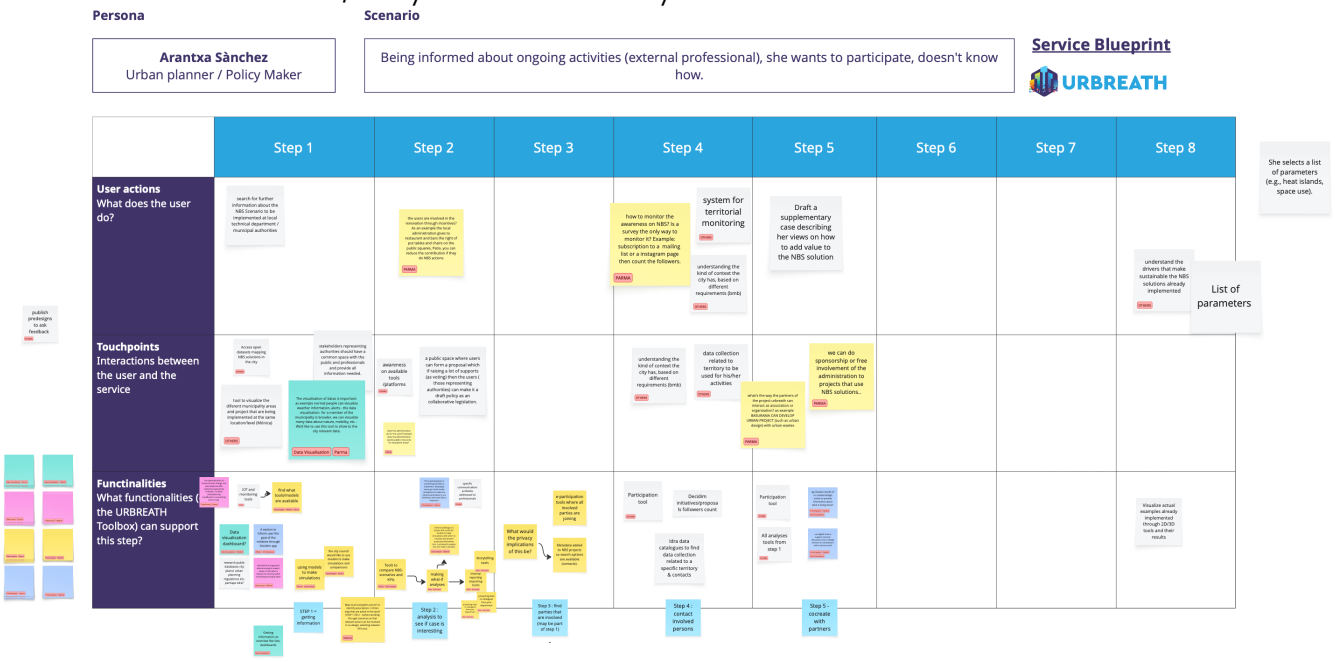
[29] According to Cohn (2004), an epic is a large story that includes different user stories. It is derived from the user story, as it can be very generic and must relate to specific actions. In this way, starting from the identification of the different user stories, ten 'epics' have been clustered, considering different aspects of the story that the users are relating to the service/platform.

- **Preliminary Phase**: This begins with a presentation of initial candidate tools, organised into four categories: Data Visualisation, Data Access, Data Analysis, and E-Participation. During this phase, participants provide feedback through an online board where they can ask questions and comment on the presented tools.

- **Interactive Phase**: Participants divide into breakout rooms according to climatic zones. Working with a moderator on an interactive online board, each group selects a user journey map and enriches it by adding detailed descriptions of URBREATH toolbox functionalities that could support each step. For example, if a user journey step involves selecting an NBS from a catalogue, the toolbox should offer filtering capabilities. These functionalities are added to the user journey using a colour-coding system to distinguish between different types (Data Visualisation, Data Access, Data Analysis, and E-Participation). The interactive sessions conclude with each group presenting their completed board to all participants.

Outcomes: This session produces two main outcomes. First, the preliminary activity generates a comprehensive assessment of city needs and preferences regarding tools. Second, the interactive phase produces enriched user journey maps with a technical layer that begins to outline the URBREATH toolbox requirements and desired functionalities. Furthermore, questions collected during the preliminary phase are compiled into a Q&A document to clarify any doubts.

Figure 10: Service Blueprint used for designing the tools functionalities to interface with the user. Figure 10a illustrates the three blocks of the Service Blueprint, introducing the 'Touchpoints'. Cities are asked to think about which functionality could help the user journey they have already discussed in the previous workshop. Figure 10b focus on the functionalities for the first two steps (step 1: getting information; step 2: analysis to see if case is interesting) of Service Blueprint and User Journey for the specific persona 'Urban Planner/Policy Maker' described by the Mediterranean Climatic Zone.



Source: Source: Miro Board, URBREATH. Mediterranean Zone (available here).

URBREATH Local Platforms Requirements

Based on the second workshop on 'tools', this second round of one-to-one meetings aims to identify the corresponding local requirements needed for each city. Following the approach adopted in the first one-to-ones, cities are asked to identify 'what' they would like to have in the local URBREATH platform, both based on the 'epics' (see section on **Users and Users' Stories**) they have identified and the functionalities mapped during the workshop (see section on **URBREATH Digital Tools**). For each functionality that has been left 'generic' on purpose, cities are asked to identify the kind of orientation and output they want from each requirement.

Objective: The aim of this activity is to delve deeper into all the functionalities mapped in the 'tools' workshop and customise them from a twofold perspective: on the one hand, the software functionalities could be adapted to the specific and contextual needs of the cities; on the other hand, there is more space to integrate, fine-tune, and detail the functionalities based on the local users (already selected and discussed in the first workshop and the related one-to-one meetings).

Tools and process: Starting with the output from the workshop on URBREATH Digital Tools, the main discussion focuses on understanding the types of digital functionalities and tools that cities foresee for their local digital solutions. The work involves mapping the specific functionalities that could enable certain identified scenarios and tools from previous workshops. This work is organised with the support of the Miro board, already used in the first one-to-one meetings, to create continuity with the internal discussion, enabling validation and refinement of epics and digital functionalities.

Outcomes: The collection of local requirements allows the refinement of both epics and user stories, establishing a more solid view and understanding of users' expectations (e.g., functionalities, what a user can perform, etc.) according to specific roles, aims, and purposes (e.g., 'as an urban planner in the city of Leuven, I would …). This consolidated collection of user stories and epics forms the basis on which the local customisation of the URBREATH Toolbox will be implemented.

Local Livign Labs definitions

Two workshops are organised, building further on the outcome of the first series of the Local Living Lab Composition. The two workshops are organised combining two different Climatic Zone in the same slot. This set of workshops had a dual focus on requirement-mapping and Local Living Lab status monitoring.
Objective: With these exercises is oriented to a deep dive, gathering detailed information and insights on the processed results of the first series of workshops held in June. This exercise was the basis for the creation of a mindmap, and the definition of epics (grouped functional requirements) and finally, the functional requirements themselves. These exercises also contributed to a first timeline, mapping URBREATH Local Living Labs project phases and actions.

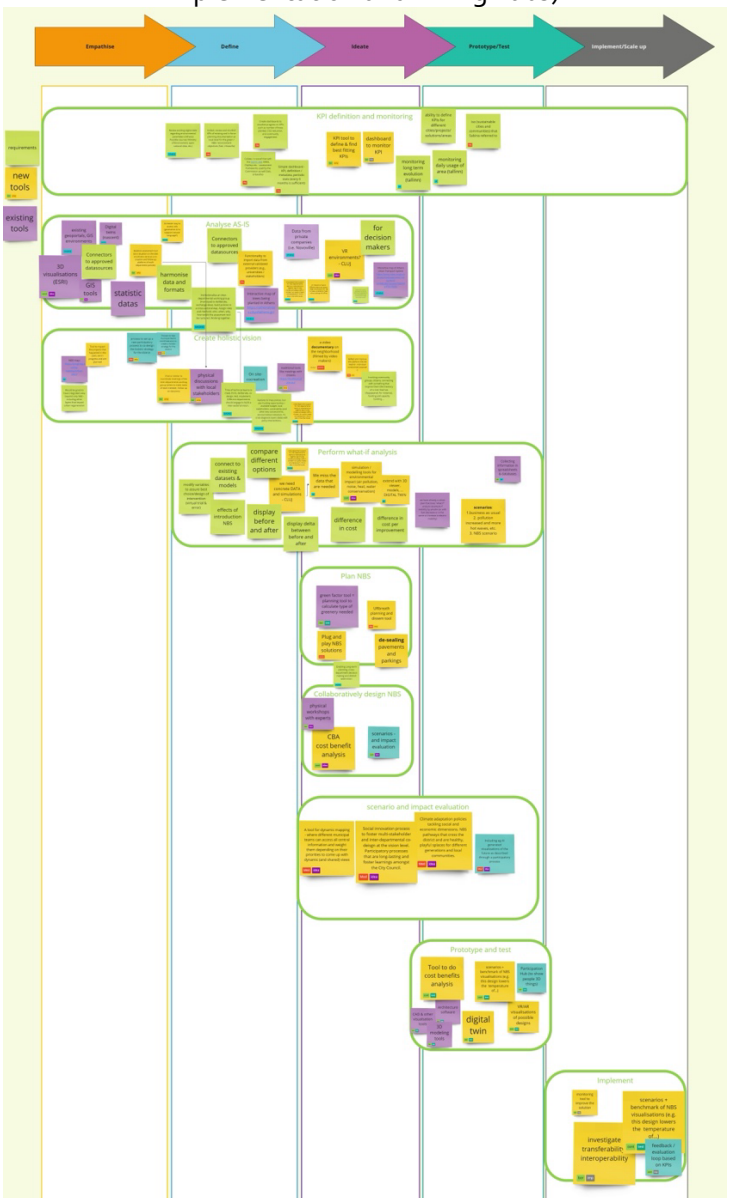
Tools and process: The workshop started with contextualising the exercises performed during the first

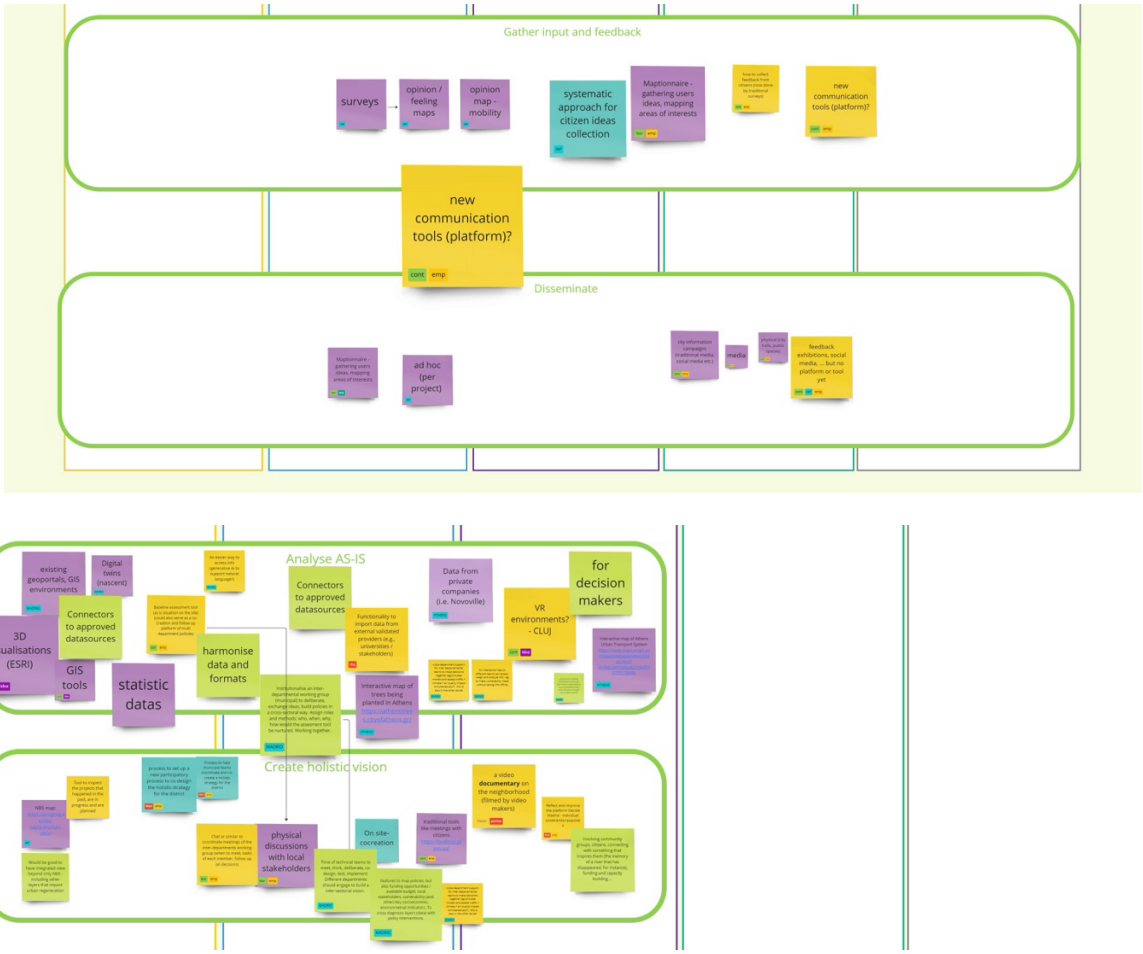
two workshops in the framework of the macro-, meso-, and micro scale of the project and the work of Use Case Scenarios and URBREATH Toolbox (see Deliverable D2.4 - Use Case Scenarios and Baselines, and Deliverable D2.5 - URBREATH Platform Requirements) and the Design and Creation of Local Living Labs. A deep dive was organised based on the processed results of the first series of workshops where the availability and needs for tools, functionalities and processes were mapped for each phase of the project, as shown in Figure 10. Based on this exercise, the available information was enriched and validated through a co-creative and moderated MIRO board exercise. For the Local Living Lab exercise, the information gathered from previous workshops are streamlined and continued working on defining and understanding the co-creation and participation aspects of the LLLs, as-is and to-be, for each phase of the project.

Outcome: Based on the first two series of workshops sufficient data were gathered to establish a mindmap summarising all gathered data at system, epic and high-level functional requirement levels (needed for the lacrosse scale and as input to be included in the set of requirements derived from the Service Blueprint exercise on User Journeys and Tools). Based on the mindmap, a list with 66 requirements was established and presented to the pilots.

Figure 11: Deep dive MIRO board exercise detailing out the availability and needs of tools, processes and functionalities for pilots' use cases.

Figure 11a illustrates the whole process of analysis, focusing on specific topics (e.g. KPIs, Analysis of the 'as-is', and the identification of the 'what-if'); while Figure 11b adds the last two specific items of the scheme about 'gathering input and feedback' and 'dissemination'. Figure 11c focuses on two key elements of the discussion at this stage: analysis of the 'as is' and how to create a holistic vision including technologies, NBS implementation and Living Labs).





Source: Miro Board organised by WP5 (available here).

Offline data workshop

The final information collection focuses on the data available to each city (e.g., population data, Geospatial Information System – GIS – data, climatic data, etc.). This activity was conducted offline, with cities asked to consult their ICT departments to verify whether the requirements identified in the previous two workshops could also be validated through available data. Meanwhile, technical partners (WP3, WP4, and WP5) are working on re-organising the insights gathered during the first two workshops. This process distinguishes between general requirements—derived from the workshops—and local requirements—emerging from the one-to-one meetings. The outcome of this exercise will provide a comprehensive overview of the existing data and its alignment with the specific requirements selected and discussed by each city.

Objective: To help cities understand which data sources they need to implement the functionalities identified in the workshop on tools. For this purpose, cities are asked to match URBREATH toolbox

functionalities with relevant data sources, also considering their availability internally with their ICT departments.

Tools and Process: During asynchronous sessions, cities are asked to complete a document listing various expected or desired functionalities and corresponding required data (based on the outcomes of the User Journey Mapping and Touchpoints or Users and Users' Stories Exchanges/Workshops). They are invited to reflect on the data required, indicating whether they already have access to it or need to obtain access. This assessment is crucial for creating a first mapping of all available data sources, allowing technical partners to gain an initial impression of the potential functionalities and requirements that can be implemented.

Outcomes: The documents completed by each city are collected and summarised to produce a comprehensive data sources document as a preliminary basis for the URBREATH toolbox.

City-to-city Exchange session: Scenarios preliminary definition

After the formulation and design of the service blueprint (composed of users, tools, and data), and the subsequent collection of requirements (both general and local), cities are asked to validate their pilot area. This exercise is a learning and training process for the cities, as they must consider the further steps they want to perform in their pilot. Therefore, unlike the first city-to-city exchange session, this one is more focused on the 'scenarios' cities would like to face and challenge. This exercise is essential for cities as they must anticipate the development of their pilot area.

Objective: To ask cities about their pilot area baseline, their challenges, and the opportunities, emphasising the scenarios they would like to deploy and implement using and developing NBS in the pilots. To present their progress in analysing and defining which kinds of future development and scenarios they would be more likely to consider in their pilot area.

Tools and Process: The two sessions are organised based on the clusters in climatic zones, and all the cities present their pilot based on a template (provided beforehand by the partners) with specific guidelines to follow. Specifically, cities are asked to consider:

- Pilot baseline: General local context, socio-economic conditions, planning regulations and/or projects in the area.
- Needs and problems of the pilot area: Considering 'urban greening needs' (e.g., increase of accessibility, climate resilience, social and recreational spaces) and 'barriers to urban greening' (e.g., community resistance, land availability, financial constraints).
- Aims and benefits: Local aims and objectives related to the specific pilot area (e.g., urban revitalisation, social inclusion, cultural preservation, biodiversity restoration), and the desired changes to be implemented in the pilot area (e.g., physical transformation, economic diversification, regulation and policy).

- Potential scenarios: Considering the needs and problems of the pilot area alongside the aims and benefits foreseen for the area itself.

Outcome: These presentations will form the basis for structuring the discussion about the use case scenarios of all the cities. According to their specific needs and expectations, the information serves as input for framing the actions and the 'essential' requirements to be included in the URBREATH Toolbox.

Use case scenarios and requirements fine-tuning

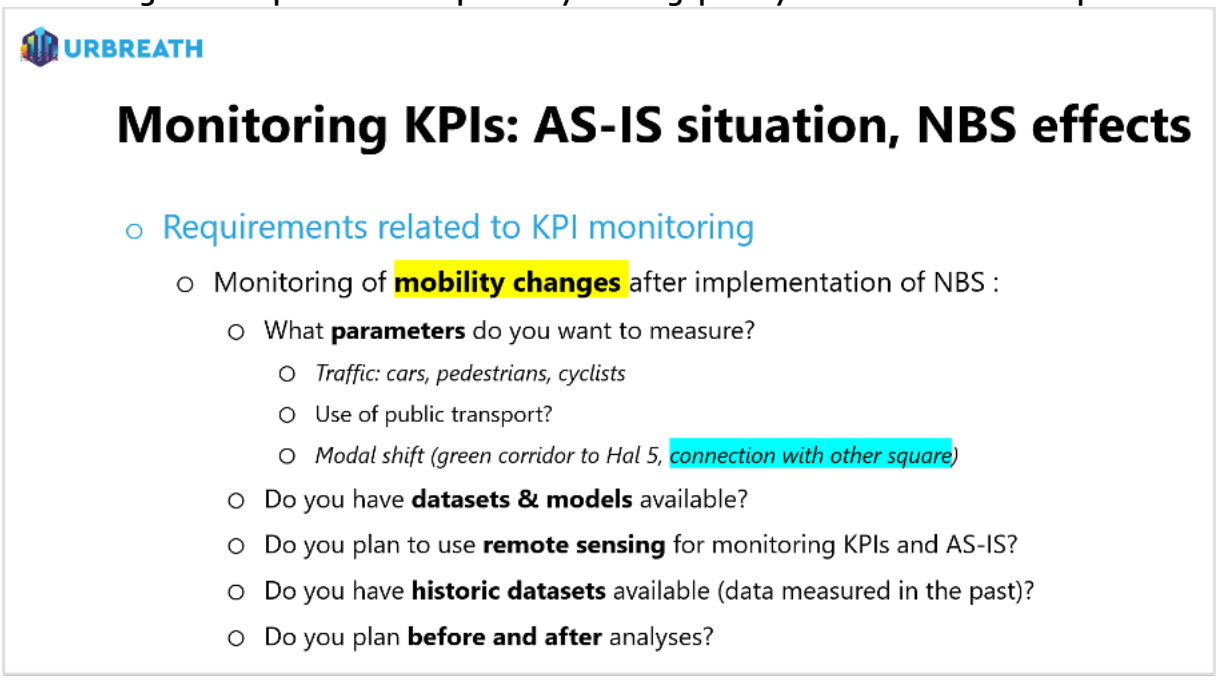
This activity entails a first re-organisation of the use cases described by each city, with referred requirements taken from the general list of functionalities and requirements collected during the workshops and one-to-one meetings. Based on the merged list of macro, meso, and micro-scale requirements, functional epics, and recent cities' use case presentations of the baselines, missing detailed information was gathered to better understand the needs, obstacles, and resources for each requirement and fill the gaps. In this case, the one-to-one sessions focus on the specific expectations cities have about their pilot area, aiming to translate the functional requirements into technical needs.

Objective: To highlight the correlation between the use case scenarios and their interpretation based on the list of requirements drafted by technical partners. This allows cities to be more specific about the processes and data they would like to use. Assessing scenarios and their related requirements is important to highlight the special needs of each city, and it serves as a double-check for technical partners to implement the URBREATH toolbox.

Tools and Process: A set of nine presentations, tailored for each pilot site, with all the selected use case scenarios has been presented to the cities, asking them to be more specific about the kind of development they have in mind. At the same time, the presentations introduce some questions—not specifically related to the technical requirements of the platform—using the list of requirements as a proxy for alternatives, introducing the ten epics divided into categories (e.g., general specifications, planning of NBS, KPI definition and monitoring NBS effects), gathered from previous activities (e.g., workshops and one-to-one activities). Additionally, for the Local Living Labs, the stakeholder list was validated, and the phases where to use these tools were pinpointed. All cities were asked for their plans on how they will make use of the tools in their Local Living Labs.

Outcome: With this exercise, each use case scenario has been linked to a specific epic, including a variety of technical, infrastructural, and non-technical requirements. This exercise helped organise further in-person activities. During the discussion, cities had the opportunity to express their expectations and needs, indicating their wishes for the technical resolution of the platform, as well as their pilot development, focusing on the initial discussion for the KPIs definition and monitoring. The discussion provides materials for further investigation of requirements and a selection of specific contextual and local requirements based on priorities.

Figure 12: One of the guiding PowerPoint slides with pilot-specific, tailored questions used during one-to-one meetings with all pilots for in-depth analysis and gap analysis of the functional requirements.



Source: Presentation made by WP5 Leader

(In-person) Initial Scenarios definition activities

This activity is composed by a series of different steps in which all the consortium have been strongly involved. Overall, there are three main workstreams:

1. Train the Trainer
2. Scenarios' Validation and Prioritisation
3. Scenarios' Assessment: Q&A

- **Train the Trainer.** In this session, the scenarios and the related epics are presented to the technical team of the consortium (WP3 and WP4). This training session is essential to ground the 'wishlist' that cities have discussed according to their needs and expectations of their scenarios from a technical perspective. This session has been organised before the collective one, where all partners interact directly with the cities (both FrontRunner and Follower).

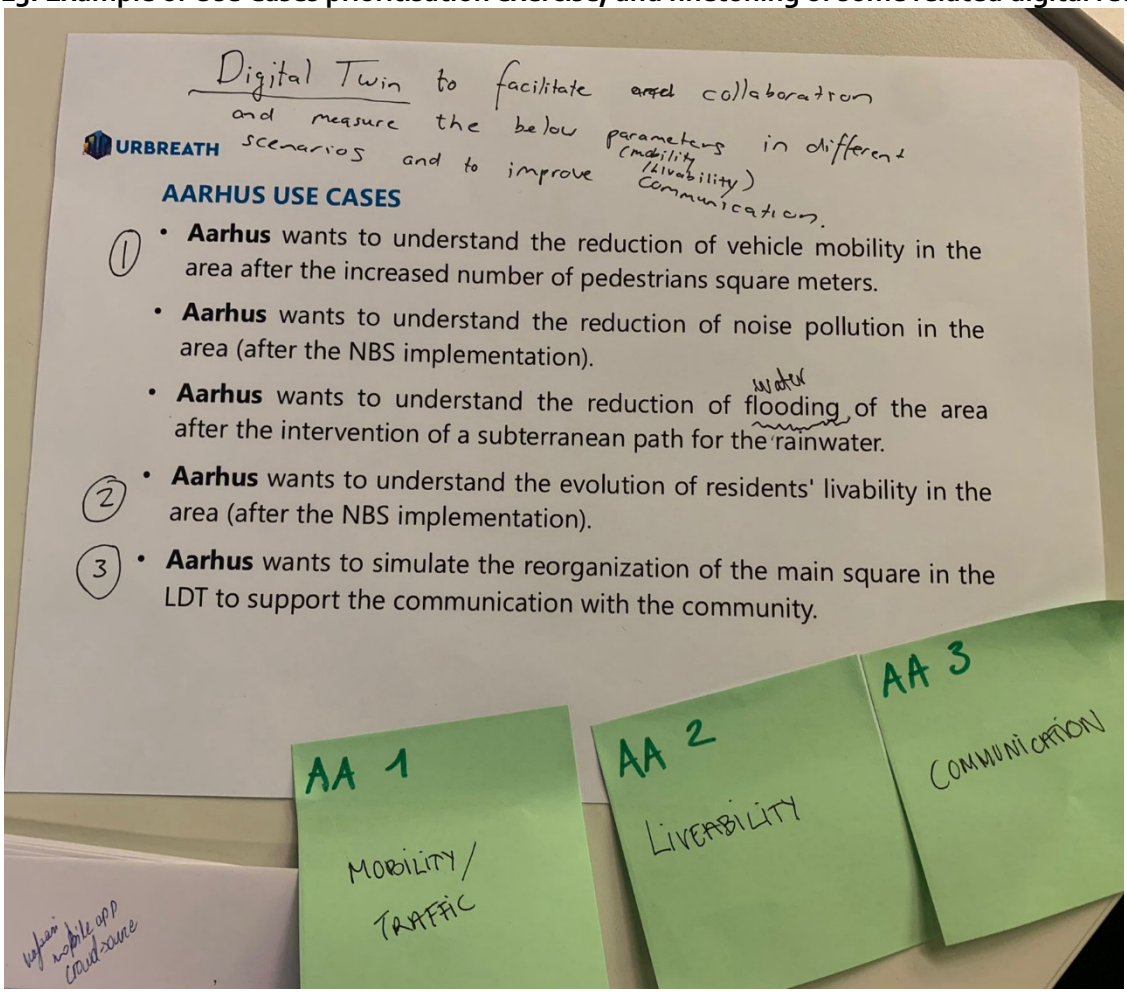
  Objective: To train the technical partners (mainly WP3-WP4) on scenario definition and the related epics, including all the potential alternatives and possible solutions to address cities' needs.
  Tools and Process: The activity consists of a presentation and open discussion from WP2 and WP5 partners, to update technical partners on the advancements made by cities. This session is

crucial for the technical partners in identifying and starting to think about the methods and processes enabling the deployment of specific requirements to the toolbox.
Outcome: All partners are updated on the scenarios, and with this general overview, technical partners are aware of the 'wishlist' cities have in terms of desired functionalities. This activity leads to the second one, which is the '**Validation and Prioritisation activity**' together with 'A**ssessment: Q&A**'.

- **Scenarios' Validation and Prioritisation**. This activity includes a discussion with cities about their identified scenarios, including all the amendments and needs they have discussed in the last one-to-one meeting (Figure 13). It also includes a re-organisation of the epics and related technical requirements.

  Objective: To validate all the scenarios that cities have identified in the 'City-to-City Exchange' and that have been amended and detailed in the 'one-to-one meeting', and to prioritise three of them, combining the related scenarios with specific epics.
  Tools and Process: The activity has been organised as a face-to-face interaction, with printed papers of all scenarios listed. The cities have been divided into four different groups according to the Climatic zones, giving them the opportunity for peer-to-peer learning and exchange. Once the scenarios are validated, including some minor changes, cities have been asked to select the three scenarios they would like to prioritise. The prioritisation process allows cities to decide which scenarios are the most important, considering the NBS implementation on the one hand, and the related epics and requirements on the other.
  Outcome: Three scenarios for each city have been selected, enabling the conduction of the second activity with the technical partners, and the feasibility assessment.

Figure 13: Example of Use Cases prioritisation exercise, and finetuning of some related digital requests.



Source: URBREATH, City of Aarhus (Atlantic Zone), General Assembly | Madrid.

- **Scenarios' Assessment: Q&A.** The second task included in the workshop is devoted to a preliminary roundtable 'Q&A', where technical partners directly interact with cities, asking for clarifications and information about their scenarios and the related requirements, in order to assess the feasibility of the scenario in question.

  Objective: To assess from a technical perspective if the selected prioritised scenarios can be feasible. This includes understanding, together with cities, if the available data matches the scenarios.
  Tools and Process: The process of assessment includes an open discussion between technical partners and cities, divided into Climatic Zones, where the feasibility of the scenarios has been associated with specific requirements and datasets. With the 'Q&A', technical partners have the

possibility to consider alternatives and potential solutions in case some of the scenarios are not realistic and/or feasible (either due to the lack of information and datasets, or due to more technical complexity).
Outcome: General understanding for the technical partners on how to implement the URBREATH Toolbox and for the cities to consider the feasibility of their selected scenarios as part of their Local Living Labs and the essential implementation of the NBS.

Assessment Q&A Follow-up

Once the scenarios are set and their prioritisation has been validated, focusing on the feasibility matrix—which combines the prioritised scenarios, epics, and related digital and technical requirements with available data in cities—technical partners start to collectively work on each city, understanding the quality of the information provided by cities and its integration in technical terms. The work is divided into two different steps:

1. **Internal (Technical) discussion and assesment**
2. **Workshop on preliminary technical solutions** for the FrontRunner Cities.

- **Internal discussion and assessment** within all the technical partners, considering the information collected during the roundtable, to provide all cities with some initial and preliminary technical solutions.

  Objective: To discuss scenarios, their related epics, and the information provided by the cities one by one, understanding which kinds of practical and technical solutions could be adopted in that specific situation, considering their technical feasibility.
  Tools and Process: The internal discussion is organised following an updated version of the presentation provided during the Train-the-Trainer session—with all the amendments and notes that have been the basis of the 'assessment' activity. Nine different meetings have been organised—one for each city—where all partners have discussed technical requirements, also considering that some of them might remain 'local' (and will have specific functionalities developed and deployed accordingly), while others could be more generic and can be included in the general list of requirements (which is available in Deliverable D2.5 - URBREATH Platform Requirements).
  Outcome: Preliminary technical solutions to be further discussed with cities and eventually re-adapted to their specific needs.

- **Workshop on preliminary technical solutions**. Presentation and workshop for discussing the preliminary technical solutions to the FrontRunner Cities, where technical partners have the possibility to discuss their initial considerations about how to 'translate' the scenario into more realistic and relatable technical requirements for the URBREATH toolbox for each FrontRunner City. These meetings are organised in four different sessions, one for each FrontRunner. These

workshops have been running in parallel with those of the Preliminary Workshop on Living Labs and NBS implementation to give cities a general overview of the proposed digital functionalities supporting them in the implementation of the NBS.

Objective: To have a first discussion with each FrontRunner City about the technical feasibility of the requirements and scenarios they have discussed in previous sessions. The aim is to present some initial technical solutions based on the URBREATH Toolbox capabilities and functionalities that are available and/or that can be realistically implemented.
Tools and Process: The discussion on requirements and technical solutions is prepared for the three scenarios that have been identified, but the focus of this meeting is to stick to one specific scenario as the starting point of a more detailed development of the toolbox.
Outcome: Initial draft and validation of potential technical solutions for the implementation of the digital URBREATH Toolbox. Selection of one scenario to be developed from a technical and functional perspective to be ready for the first mock-up of the toolbox, and the implementation of the Local IT solutions in the cities.

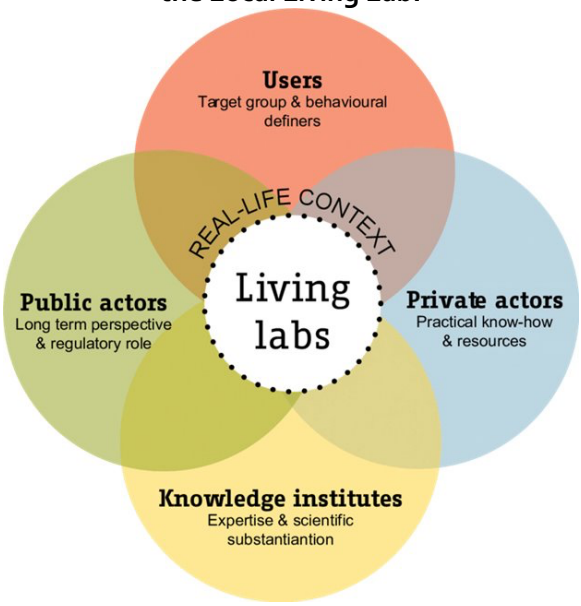
3.2.2 Local Living Labs

Living Labs follow the principles of co-creation expressed in the previous chapter, but they add more complexity in terms of organisation and experimentation. The role of Living Labs in activities towards nature restoration and sustainable development has progressively gained attention, recently resulting in a Guidebook for co-creation and co-governance on NBS (European Commission, 2023). In this light, municipalities, other territorial agencies, and stakeholders from the private sector gradually consider Living Labs as essential tools for a co-governance approach towards urban transition and innovative pathways for urban sustainability (Mahmoud et al., 2021; Leal Filho et al., 2023), especially considering NBS deployment as a key component of this nature-oriented development (McCormick, 2020).

According to Lupp et al. (2021), the concept of 'Living Labs' or 'living laboratories' was first used in the early 1990s by Bajgier et al. to describe students' experimentation to solve problems in a Philadelphia neighbourhood (Bajgier 1991, p. 701). For this reason, co-creation and learning methodologies have been grounded in Living Lab activities, which started to gain importance because of their innovative nature and potential in testing, validating, developing, and co-creating—at all stages—specific decision-making processes. Moreover, Living Labs are considered a 'dynamic multi-stakeholder network: a network that aims to boost and manage user-driven innovation in real-world settings' or as a trigger for stimulating interactions between technological and socio-economic expertise (Compagnucci et al., 2021). In general, one of the key aspects of Living Labs is their horizontal and equal approach in all steps (Steen and van Bueren, 2016). One of the first discussions on Living Labs was at the end of the Nineties with the example of the Triple Helix Model (THM, see Etzkovitz, 1998). This approach brings together universities, industries, and governments. In 2009, the 'triple helix' was improved by adding another helix – the Quadruple Helix Model (see Carayannis and Campbell, 2009; Yawson, 2009; Priday and

Pedell, 2017), considering the increasing importance that civil societies might play in decision-making processes (Figure 14). For this reason, in 2006, the EC introduced civic participation and co-creation as fundamental processes through which activities and decisions are implemented, introducing the concept of Living Labs (European Commission, 2009). The concept was formally introduced in Europe in the early 2000s as part of the European Commission's Lisbon Strategy (2000) to enhance innovation and economic growth. Initially, some of the benefits of considering Living Labs as tools to deploy user-driven innovation and stakeholder engagement were linked to the capability of potentially 'filling the gap' between theory and practice and between technology and development (European Commission, 2008). More recently, the main funding agency supporting Living Labs in Europe—the Joint Programming Initiative (JPI) Urban Europe—introduced the term 'Urban Living Lab', considering the essential role of the environment and contexts in performing co-creative processes and solutions to explore and experiment with scenarios, processes, and real contexts (JPI Urban Europe, 2019).

Figure 14: Quadruple Helix model, which represents the main stakeholders that need to be involved in the Local Living Lab.



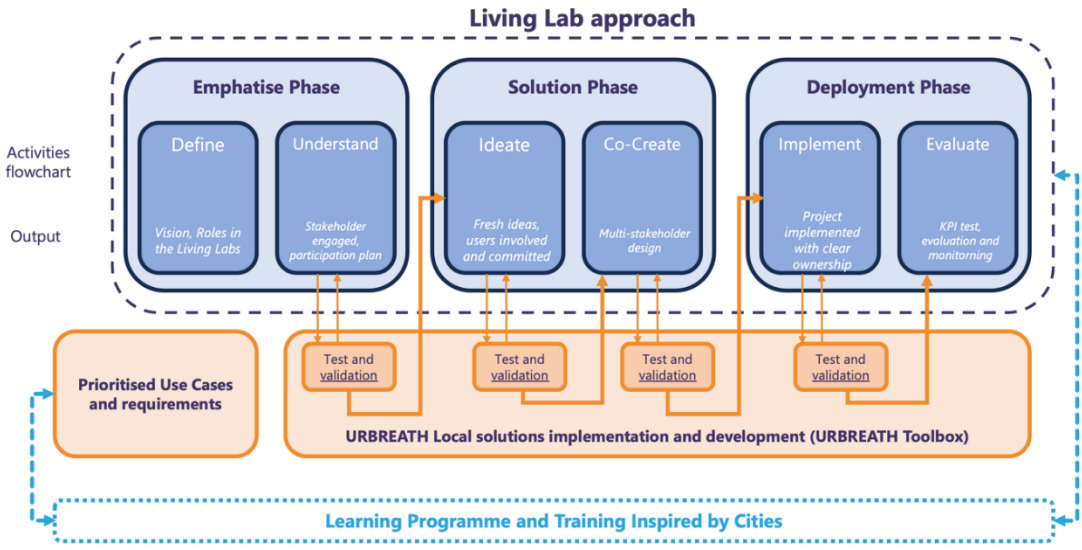
Source: "Urban Living Labs: A Living Lab Way of Working" (Steen and van Bueren, 2017)

In this light, the URBREATH methodology is also framing the organisation and first steps of the Living Labs, which will be further developed and updated in the second release of this document. It should be noted that Living Labs are networks of stakeholders and actors from different realities that work mainly—but not exclusively—at the local scale, adopting methods and tools strictly related to co-creation and participatory approaches, and focusing on specific issues, challenges, or activities to be prototyped and experimented with at a micro-scale. Our methodology explicitly builds on the lessons learned from earlier Living Labs in past and present European projects. The UNALAB Living Lab

handbook for Urban Living Labs developing nature-based solutions[30] was a major source of practical inspiration. Additionally, the ongoing work of Living Labs in the EU soil mission, specifically the NATI00NS project[31] and the European Network of Living Labs (ENOLL), has been important guidance.

Based on the scientific review, earlier EU projects, and the activities planned within the URBREATH project, we propose the following Living Lab framework (Figure 15). The framework provides an overview of crucial phases and steps FrontRunner and Follower cities need to go through to successfully implement NBS supported by state-of-the-art digital tools.

Figure 15: Quadruple Helix model, which represents the main stakeholders that need to be involved in the Local Living Lab.



Credits: Elaboration from the authors.

The framework is divided into three layers. The first layer shows the phases that cities have to consider for the implementation of the Local Living Labs, including the internal processes and milestones to be achieved within the timespan of the project (2024-2027). Briefly, it outlines the composition of the Living Lab with the related outputs[32]. The second layer shows the development and interaction of tools

[30] Source: https://unalab.eu/system/files/2020-07/living-lab-handbook2020-07-09.pdf (Last Access: February 2025).
[31] Webinar available here: https://nati00ns.eu/events/living-lab-essential-how-set-living-lab ; presentation available here: https://zenodo.org/records/8073797 (last access February 2025).
[32] In brief:

- The **Empathise phase** involves defining and understanding urban challenges through collaboration with residents, using qualitative data from interviews, surveys, reports, and observations to ensure solutions are relevant and inclusive.

developed by the technical partners, tested and improved in the cities' real-world environments, resulting in the URBREATH Toolbox: this step stresses and enhances the relationships between the output of the Local Living Labs with a process of testing and validation in the technical domain. It, indeed, emphasises the continuous loop between the Local Living Lab phases and the testing and validation happening at the digital toolbox level. The third layer shows the continuous capacity building that city representatives will take part in during our project, with different inputs from non-city partners, Training Mission and City Forum (WP7), and peer-to-peer learning.

The URBREATH Living Lab framework follows the principles of the URBREATH methodology

- **Structure**. The Living Lab approach offers flexibility, recognising that cities are at different levels of maturity. This variation also influences the modularity of the process for designing and defining the Living Labs, as each step incorporates specific activities (see Figure 15). At the same time, the methodology is scalable, following the Frontrunner-Follower model. In this approach, activities and experiments conducted in Frontrunner Cities serve as reference examples, enabling further generalisation and adaptation in Follower Cities.
- **Process**. The design and preparation of the Living Labs follow four key steps. First, the process begins with scoping and identifying the relevant stakeholders, prioritising their involvement. Next, activities and processes are developed to activate internal and local co-creation dynamics. The third step involves scaling—from the methodological framework to more adaptable, context-based processes that consider each city's institutional framework and socio-economic conditions. Finally, the standardisation phase consolidates the findings and experiments conducted across different cities, leading to the creation of a strategy for developing Living Labs that can be integrated into various contexts across Europe and beyond.
- **Knowledge**. In this regard, the three levels of learning are essential in the creation and development of the Living Lab. Learning by doing is bound to experimentation and daily practices, which contribute to creating patterns of interaction that can work in the pilot, and more broadly, in the cities involved in the process. At the same time, learning by interacting is strictly related to:
    - The interaction among partners involved in the Living Lab (where co-creation and decision-making processes are essential). In this case, the internal co-creation in the Living Lab must be structured considering what has been extensively discussed regarding ‘communicative planning’ (see Habermas, 1985; Forester, 1980 and 1982). Along this

- The **Solution phase** focuses on brainstorming and co-creating innovative solutions with stakeholders from government, academia, industry, and citizens. The Ideate step generates creative ideas, while the Co-create step refines and develops these ideas, ensuring they are viable and appropriate for the community.
- The **Deployment phase** implements and evaluates these solutions using Key Performance Indicators (KPIs) like safety, livability, accessibility, number of plant species, permeability, and green coverage. This ensures the solutions meet city goals and residents' needs, guiding future urban development and enhancing urban life quality.

More details on the Living Lab composition and steps will be provided in Deliverable D5.5 - Local Living Labs report - V1 (M18).

vision, learning by interacting focuses on the actual and foreseen civic participation and stakeholder engagement, which needs to relate to the identification and assessment of 'trading zones' or specific arenas. These might strengthen objectives and visions among the different stakeholders to achieve partial but still relevant outcomes (Balducci and Mäntysalo, 2013).

- The interaction between Frontrunner Cities and Follower Cities, which includes monthly meetings on the Living Lab approach and advancements. In this way, cities can assess their level of maturity and compare it with other cities engaged in the creation of the Living Lab, contributing to peer-to-peer learning.
- The interaction with the 'non-city partners', which is essential in the development of NBS in the pilot areas and for the development of the URBREATH local platforms.

Reflexivity and reflexive learning in the Living Labs are crucial in redefining, accommodating, and monitoring the activities and experimentations in the pilot area and in the decision-making arenas.

- **Experiment**. Living Labs will also integrate the cross-scaling approach (micro-meso-macro). While still happening on the micro scale of the pilot area, the Living Lab approach implemented by different cities will open possibilities for diverse experimentations on similar projects on NBS implementation within the city. The consolidated practice of the Living Lab might expand to a broad audience, becoming a best practice within the institutional framework. It is important to highlight that the Living Lab is a prototype and a 'sample' of a broader community, and its experimentation in a pilot area is essential in understanding challenges, opportunities, and practice enablers.

In designing the Living Labs for Frontrunner and Follower Cities, some initial mapping activities and preliminary thoughts are developed during the co-creation processes (see **Section 3.2.1**), which involve interactions among partners within the consortium. Once the internal framework is established, cities are then asked to engage externally, using a variety of methods and tools to design and create the Living Labs.
This section will briefly describe the preliminary activities in drafting the structure of the Local Living Lab in both Frontrunner and Follower Cities.

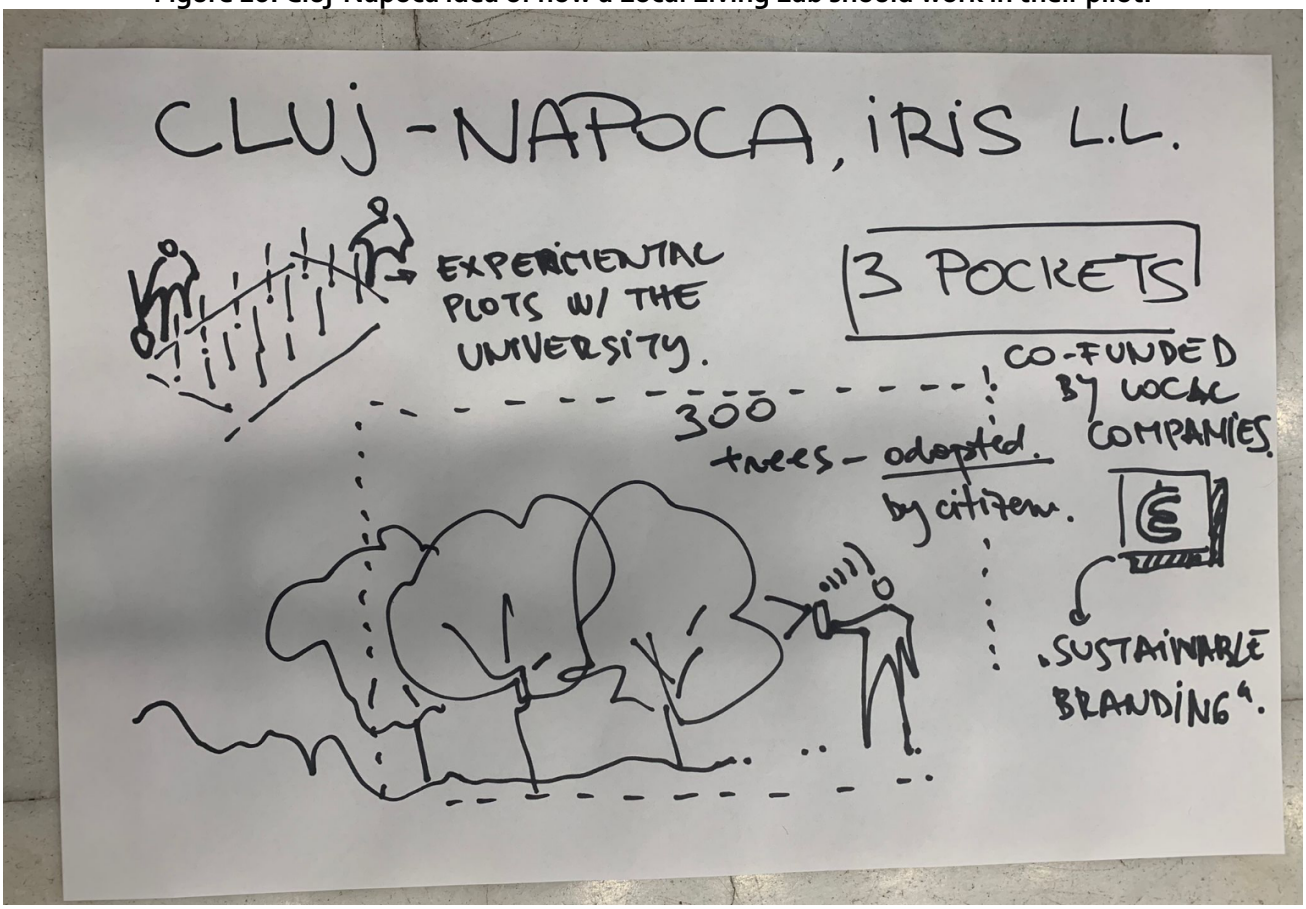
Living Lab Workshop: Kick-off

The initial approach to structuring the Living Lab involves four roundtables with cities, divided by climatic zones. This setup allows cities to start considering what they would like to do and experiment with in the context of the Living Lab, with a specific focus on the pilot area. The discussion was led by the WP5 coordinator of the Living Labs within the consortium. This initial discussion enables cities to visualise and plan the process for implementing the pilot area with the deployment of the NBS.

Objective: To begin identifying stakeholders to be included in the Living Lab, the types of processes and methods the cities are likely to employ, and the objectives they aim to achieve through the experimentation of the Living Lab in the pilot area.
Tools and Process: The discussion starts with an overview of the key characteristics of the Living Lab and its steps. Cities are divided into clusters based on climatic zones, and each city is asked to focus on (i) its resources, as well as its institutional and policy tools for conducting robust experimentation, and (ii) the expected outcomes for the pilot area. The interaction between Frontrunner and Follower Cities is a key element, emphasising the potential experiences that can be tested during the implementation of the Local Living Labs.

Outcome: A vision of what they aim to achieve within their Living Labs and which stakeholders to prioritise within their approach.

Figure 16: Cluj-Napoca idea of how a Local Living Lab should work in their pilot.



Source: URBREATH, City of Cluj-Napoca (Continental Zone), General Assembly | Madrid.

Preliminary Workshops on Living Labs and NBS implementation

The Living Lab approach and methodology must be structured similarly across the different Frontrunner and Follower Cities. For this reason, the partners responsible for the implementation and support of the Local Living Labs present a 'refresh' and preliminary overview of what a Living Lab is, following the structure of the quadruple helix and the levels of citizen participation (inform, consult, involve, collaborate, and empower; see also the level of e-participation in **Section 2**). As the Living Lab will be directly related to the pilot sites and their implementation, this presentation encourages cities to consider the types of NBS they would like to deploy at their pilot sites, with specific reference to the scenarios validated and finalised in previous workshops (see also Deliverable D2.4 - Use Case Scenarios and Baseline).

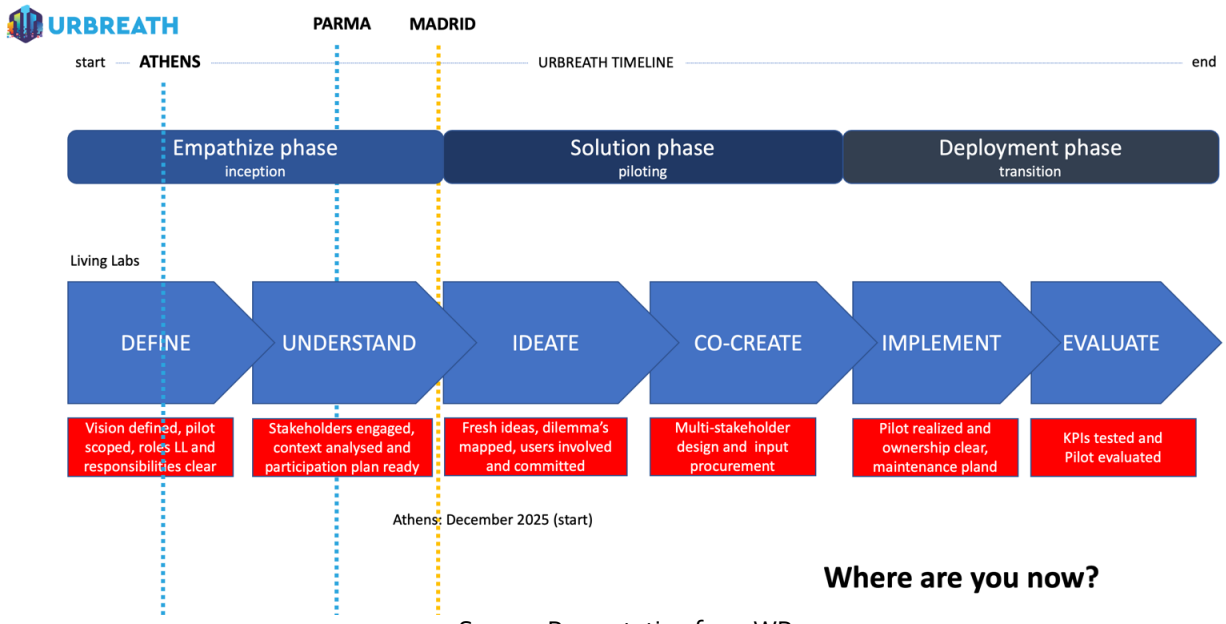
These workshops have been running in parallel with the Workshop on preliminary technical solutions, providing cities with a general overview of the links between the digital platform in each city, the implementation of the NBS, and the experimentation of decision-making and co-creation processes. In this context, the loop between Local Living Labs, NBS implementation, and digital solutions is crucial, and the element of the Living Lab is essential in transitioning to the other (local IT solutions – WP3 and WP4).

Objective: The main objectives of this workshop are to refresh the concept of the Living Lab and its framework, ensuring alignment on planning and strategy. It aims to clarify the responsibilities of both cities and the consortium, defining roles and expectations for all involved parties. Additionally, it focuses on confirming internal Living Lab roles, the essential involvement of external stakeholders, and identifying ambitions for participation to foster effective collaboration. The phase also seeks to validate and enrich the KPIs for the pilots, ensuring that they accurately measure the impact and success of the initiatives. Lastly, it aims to identify and present the necessary expertise on Nature-Based Solutions (NBS), ensuring that the right knowledge and skills are available to support the development and implementation of sustainable urban solutions.

Tools and Process: The discussion is supported by a presentation that is updated with feedback from cities during the discussion. The presentation is divided into three main sections: (i) a general overview of the key elements of the Living Labs, their aims, and structure – identifying the stakeholders to involve in the quadruple helix in each pilot, and describing the responsibilities between the consortium, cities, and local supporters; (ii) a first overview of the KPIs and a mock-up of the KPI dashboard and Digital Twin Storytelling tool; (iii) the ambition of participation in each phase of the project and the preference from cities on which tools to use within the Living Lab Framework.

Outcome: All these steps of the Living Lab approach have been discussed during the meeting, and cities were asked to assess and point out where they currently stand, being aware of the next steps to reach the internal milestones.

Figure 17: Example of assessment by FrontRunner and Follower Cities in the Mediterranean Climatic Zone about their 'as-is' status of the Local Living Labs. The FrontRunner City (Madrid) is in-between the 'empathise' phase and the 'solution phase', while Follower Cities (Athens and Parma) are still in a definition phase.



Source: Presentation from WP5

Stakeholder mapping exercise: the quadruple helix approach

Once the general structure of the Living Lab is defined, the next step for cities is to thoroughly identify the stakeholders to be included and ensure their commitment to the project's objectives and NBS implementation. At the same time, it is crucial for cities to create the right environments for stakeholders to engage in decision-making processes. In this phase, cities are tasked with mapping the specific stakeholders to be involved in the quadruple helix model.

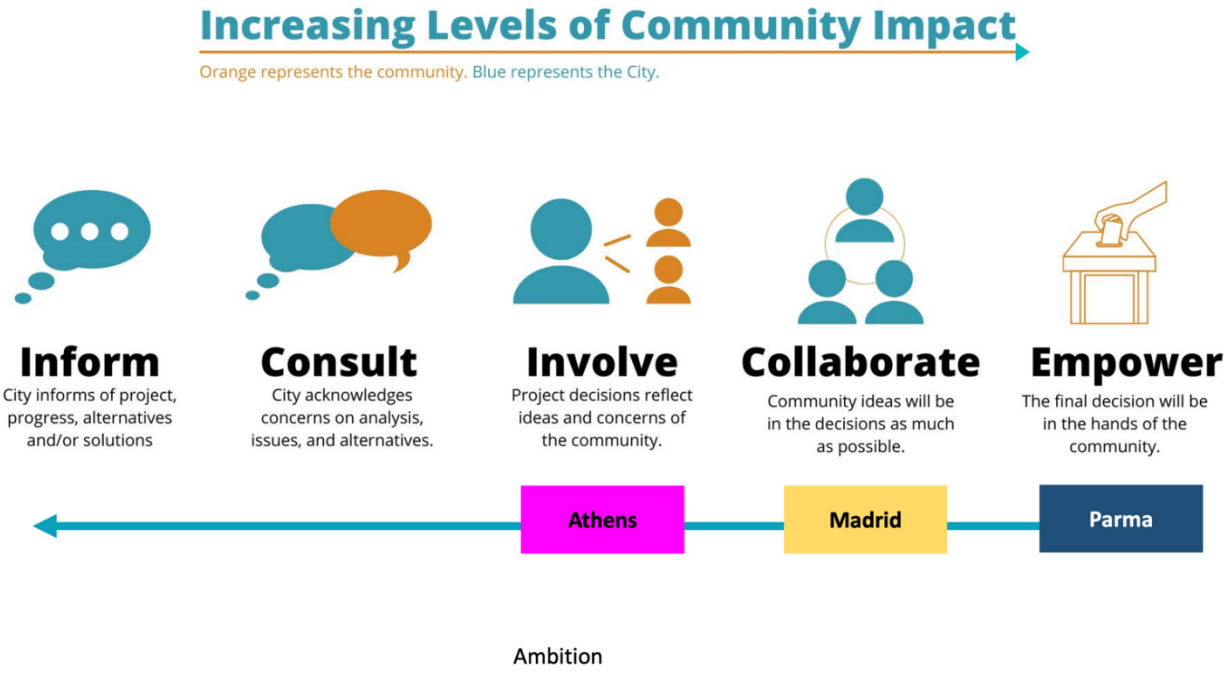
Objective: The goal is to define which stakeholders should be involved in the Local Living Lab for each city. Cities must engage these stakeholders in discussions by presenting the project in the pilot area, aligning on priorities and scenarios, and clarifying roles and commitments.

Tools and Process: The process is mainly an offline activity to be performed by the cities, which must engage and involve key stakeholders in the Living Lab, as well as ensure their commitment to actively participating in testing co-creation, NBS implementation, and digital tools deployment.

Outcomes: Assessing the cities' progress in the Living Lab framework, identifying local stakeholders as structured by the quadruple helix, and choosing an ambition for community engagement. Additionally, the goal is to understand the areas of expertise within the consortium and the cities, as well as to

explore relevant best practices for NBS implementation. All cities must finalise the first phase (empathising phase) of the Living Lab creation, with the definition and understanding phases completed. They can then begin focusing on the solution phase, with particular attention given to the ideation step.

Figure 18: Participation Assessment (both for the FrontRunner and for the Follower Cities) and the ambition they have to reach with the implementation of the Local Living Lab, within the URBREATH project.



Source: Presentation from WP5 (https://www.iap2.org/page/SpectrumEvolution)

City Call

These sessions are specifically structured and oriented towards the nine cities. These meetings are organised to facilitate peer-to-peer learning on specific topics and challenges that cities are facing (e.g., challenges in Local Living Lab implementation, conflict management, and co-creation processes in the pilot area). They are also devoted to partners who wish to interact with cities on specific topics (e.g., KPI monitoring, inputs from other projects). They follow the interconnection between NBS implementation and the decision-making processes within the Local Living Labs, and explore the synergies and focus areas for further training sessions (e.g., technical partners and local IT solutions presented to cities; KPI revision and adaptations[33]).

[33] These topics, and the Train the Trainer sessions will be extensively presented in the next releases.

Objective: To provide the consortium with the opportunity to share information and enable cities to engage in peer-to-peer exchanges regarding their progress in the preparation and design of the Local Living Labs.

Tools and Process: Presentations and discussions on specific topics prepared by the consortium (e.g., e-participation platform and its deployment in the local IT toolbox, KPI management and validation) and peer-to-peer exchanges with open discussion.

Outcomes: A shared vision for the entire consortium regarding the Local Living Labs and the further steps to be implemented across the different Work Packages.

4 Further activities and further steps

This final section outlines the next activities to be implemented before the release of the second version of the URBREATH Methodology in December 2025. As mentioned in **Section 1**, this document serves as a living document, detailing the activities carried out throughout the project as the overall methodology is further refined. Additionally, the living document allows for flexibility in future updates. In particular, the second version of the methodology will focus on a set of key elements:

- The **integration of the Local Living Labs** with the **implementation and deployment of the NBS** in the pilot sites of the Frontrunner Cities, alongside adaptive decision-making pathways in response to uncertainty and climate hazards.
- The **project planning of the actual implementation of the pilot site** in the four Frontrunner Cities. This activity will include a detailed work plan with milestones and processes to follow.
- The **deployment of the local IT solutions**, based on the local requirements that have already been set and validated, with potential integrations informed by feedback from the Living Labs and additional needs identified by the cities.
- The **learning process from Frontrunner to Follower Cities**, including the mechanisms for scaling in/out/deep and standardisation, with a focus on 'lessons learned,' 'levers,' and 'open challenges.'
- The **monitoring and evaluation process** to set milestones and criteria for a comprehensive assessment of the project.

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6 Annexes

Annex I

Here are listed all the 122 e-participation platforms that have been used to benchmark the more suitable platforms to be deployed for the URBREATH toolbox. The criteria that are listed are those allowing the creation and selection of the shortlisted e-participation candidate tools.

Name of the e-participation Platform	Status	Purpose	Cross-context / Context-specific	Open Source	Website URL	Provider Country	decision-making	open suggestions
76engage	Active	Multi-purpose	Cross-context	Not declared	76engage	Canada	1	1
Adhocracy+	Active	Multi-purpose	Cross-context	Yes	https://adhocracy.plus/	Germany	1	1
AllOurIdeas	Active	Multi-purpose	Cross-context	Yes	http://www.allourideas.org/	USA	0	1
AppCivist	Active	Multi-purpose	Cross-context	Yes	https://www.appcivist.org/	USA	1	1
ArcGIS CityEngine	Active	Single-purpose	Cross-context	Not declared	https://www.esri.com/it-it/arcgis/products/arcgis-cityengine/overview	USA	1	0
Argù	Active	Multi-purpose	Cross-context	Yes	https://docs.argu.co/about.html	Netherlands	1	1
Assembl	Active	Multi-purpose	Cross-context	Yes	https://www.bluenove.com/en/offers/assembl/	France	1	1
Balancing Act	Active	Multi-purpose	Cross-context	Not declared	https://abalancingact.com/	USA	0	0
BiPart	Active	Multi-purpose	Cross-context	Not declared	https://www.bipart.it/intro	Italy	1	1
Bogotà Abierta	Active	Multi-purpose	Context-specific	Not declared	https://bogotaabierta.gov.co/	Colombia	0	1
CapCollectif	Active	Multi-purpose	Context-specific	Yes	https://www.cap-collectif.com/	France	1	1
Citizen OS	Active	Multi-purpose	Cross-context	Yes	https://citizenos.com/	Estonia	1	1
CitizenSpace	Active	Multi-purpose	Cross-context	Not declared	https://www.delib.net/citizen_space	UK	1	0

Civis	Active	Multi-purpose	Cross-context	Partial	https://www.civisanalytics.com/	USA	0	1
Civocracy	Active	Multi-purpose	Cross-context	Not declared	https://www.civocracy.com/	France	0	1
CoBudget	Active	Multi-purpose	Cross-context	Yes	https://cobudget.com/	New Zealand	0	1
Cocoriko	Active	Multi-purpose	Cross-context	Not declared	https://www.cocoriko.org/en/	Canada	0	1
Colab App	Active	Not valid	Cross-context	Yes	https://colab.google/	USA	0	1
Commonplace	Active	Multi-purpose	Cross-context	Not declared	https://www.commonplace.is/	UK	1	1
Consider.it	Active	Multi-purpose	Cross-context	Yes	https://consider.it/	USA	0	1
CONSUL	Active	Multi-purpose	Cross-context	Yes	https://consuldemocracy.org/en/	Netherlands	1	1
ConsultVox	Active	Multi-purpose	Cross-context	Not declared	https://www.consultvox.co/	France	1	1
CoUrbanize	Active	Multi-purpose	Cross-context	Yes	https://www.courbanize.com/	USA	1	1
CrowdSpot	Active	Multi-purpose	Cross-context	Yes	https://crowdspot.com.au/	Australia	0	1
Decidim	Active	Multi-purpose	Cross-context	Yes	https://decidim.org/	Spain	1	1
DemocraciaOS	Active	Multi-purpose	Cross-context	Yes	https://democraciaos.org/en/	Argentina	1	1
Dialogue	Active	Multi-purpose	Cross-context	Not declared	https://www.delib.net/dialogue	UK	0	1
Discuto	Active	Multi-purpose	Cross-context	Not declared	https://www.discuto.io/en	Austria	0	1
GoVocal	Active	Multi-purpose	Cross-context	Yes	https://www.govocal.com/	Belgium	1	1
e-Democracia	Active	Multi-purpose	Context-specific	Not declared	https://edemocracia.cl.df.leg.br/wikilegis	Barzil	0	1
ElectionBuddy	Active	Multi-purpose	Cross-context	Yes	https://electionbuddy.com/	Canada	1	0

EngagementHQ	Active	Multi-purpose	Cross-context	Not declared	https://granicus.com/product/engagementhq/	USA	1	1
Etherpad	Active	Not valid	Cross-context	Yes	https://etherpad.org/	Not declared	0	1
Factiverse	Active	Not valid	Cross-context	Not declared	https://www.factiverse.ai/	Norway	1	0
Fiskkit	Active	Multi-purpose	Cross-context	Not declared	https://fiskkit.com/	USA	0	1
FixMyStreet	Active	Single-purpose	Cross-context	Yes	https://fixmystreet.org/	UK	0	1
Flu Near You	Active	Single-purpose	Context-specific	Not declared	https://outbreaksnearme.org/us/en-US	United States or Canada	0	0
Fluicity	Active	Multi-purpose	Cross-context	Yes	https://get.flui.city/en	France	1	1
Framapad	Active	Not valid	Cross-context	Not declared	https://framapad.org/abc/en/	France	0	1
Good Judgement	Active	Multi-purpose	Cross-context	Not declared	https://goodjudgment.com/	USA	0	0
GrowFunding	Active	Multi-purpose	Context-specific	Not declared	https://growfunding.be/en	Belgium	0	1
The Hive	Active	Multi-purpose	Cross-context	Not declared	https://the-hive.com.au/	Australia	0	1
Ideascale	Active	Multi-purpose	Cross-context	Not declared	https://ideascale.com/	USA	0	1
iNaturalist	Active	Single-purpose	Cross-context	Yes	https://www.inaturalist.org/	USA	0	1
Konveio	Active	Multi-purpose	Cross-context	Not declared	https://www.konveio.com/	USA	0	1
La Ruche	Active	Multi-purpose	Context-specific	Not declared	https://laruchequebec.com/en/about/mission	Canada	0	0
LiberOpinion	Active	Multi-purpose	Context-specific	Not declared	https://liberopinion.com/	Portugal	1	1
LiquidFeedback	Active	Multi-purpose	Cross-context	Yes	https://liquidfeedback.org/	Berlin	1	1
Local Voices Network	Active	Not valid	Cross-context	Not declared	https://lvn.org/about/	Boston	0	0

Loomio	Active	Multi-purpose	Cross-context	Yes	https://www.loomio.com	New Zealand	1	1
Make.org	Active	Multi-purpose	Cross-context	Not declared	http://make.org	France	0	1
Maptionnaire	Active	Multi-purpose	Cross-context	Not declared	https://www.maptionnaire.com/	Finland	0	0
MetroQuest	Active	Multi-purpose	Cross-context	Not declared	https://metroquest.com/	Canada	0	0
Mon avis Citoyen	Active	Multi-purpose	Context-specific	Not declared	https://www.monaviscitoyen.fr/	France	0	1
Neighborland	Active	Multi-purpose	Cross-context	Not declared	https://neighborland.com/	USA	0	1
Novoville	Active	Multi-purpose	Cross-context	Not declared	https://www.novoville.com/	Greece	0	1
Open Town Hall	Active	Multi-purpose	Context-specific	Not declared	https://montgomeryparks.org/projects/public-input/	USA	0	1
Participate.Online	Active	Not valid	Cross-context	Not declared	https://participate.online/	USA	0	1
Patronicity	Active	Multi-purpose	Cross-context	Not declared	https://www.patronicity.com/	USA	0	0
PlaceSpeak	Active	Multi-purpose	Cross-context	Not declared	https://www.placespeak.com/	Canada	0	1
Polis	Active	Multi-purpose	Cross-context	Yes	https://pol.is/home	USA	1	1
PublicInput	Active	Multi-purpose	Cross-context	Not declared	https://publicinput.com/	USA	1	1
PSi	Active	Multi-purpose	Cross-context	Not declared	https://psi.tech	UK	0	1
Remesh	Active	Multi-purpose	Cross-context	Not declared	https://www.remesh.ai	USA	0	1
Talk to the City	Active	Multi-purpose	Cross-context	Yes	https://talktothecity.org/	N/D	0	0
Spacehive	Active	Multi-purpose	Cross-context	Not declared	https://www.spacehive.com/	UK	0	1
Stig APK app	Active	Multi-purpose	Context-specific	Not declared	https://stig.en.softonic.com/android	N/D	0	1

UnHangout	Active	Multi-purpose	Cross-context	Yes	https://unhangout.media.mit.edu/	USA	0	0
Ushahidi	Active	Multi-purpose	Cross-context	Yes	https://www.ushahidi.com/	Kenya	0	0
YourPriorities	Active	Multi-purpose	Cross-context	Yes	https://www.yrpri.org/domain/3	Reykjavik, Iceland	1	1
Zencity	Active	Multi-purpose	Cross-context	Not declared	https://zencity.io	Israel	1	1
ZmapujTo	Active	Multi-purpose	Context-specific	Not declared	https://www.zmapujto.cz/	Czech	0	1
Social Pinpoint	Active	Multi-purpose	Cross-context	Not declared	https://www.socialpinpoint.com/	New South Wales, Australia	1	1
Engagement Hub	Active	Multi-purpose	Cross-context	Not declared	https://www.socialpinpoint.com/platform/engagement-hub/	New South Wales, Australia	1	1
MindMixer	Active	Multi-purpose	Cross-context	Not declared	https://www.mindmixer.com/	USA	0	1
Otakantaa	Active	Multi-purpose	Context-specific	Not declared	https://www.otakantaa.fi/sv/tietoa-palvelusta/1/	Finland	0	1
Demodice	Active	Not valid	Cross-context	Not declared	https://demogames.eu/en/democracy-game-box/demodice	EU	0	0
Observers	Active	Single-purpose	Cross-context	Not declared	https://eu-citizen.science/project/395	EU	0	0
Mi Senado	Active	Single-purpose	Context-specific	Not declared	https://www.senado.gov.co/index.php	Colombia	1	1
EMPATIA	Active	Multi-purpose	Cross-context	Yes	https://empatia-project.eu/	Italy	1	1
Alto al Didymo	Active	Single-purpose	Context-specific	Not declared	https://latinno.net/es/case/4001/	Chile	0	1
Humanitarian OpenStreetMap Team	Active	Multi-purpose	Cross-context	Yes	https://www.hotosm.org/	USA	0	0
Harassmap	Active	Single-purpose	Cross-context	Not declared	https://harassmap.org/en/	Egypt	0	1
Safecity	Active	Single-purpose	Cross-context	Not declared	https://webapp.safecity.in/	India & USA	0	1

Civic Power	Active	Multi-purpose	Context-specific	Not declared	https://tc.civicpower.io/	France	1	0
Colidee	Active	Multi-purpose	Context-specific	Not declared	https://colidee.com/	France	0	1
Dites Noous Tout	Active	Multi-purpose	Context-specific	Not declared	https://ditesnoustout.fr/	France	1	1
Eolas	Active	Multi-purpose	Context-specific	Not declared	https://www.eolas.fr/37-participation-citoyenne.htm	France	1	0
idCity	Active	Multi-purpose	Context-specific	Not declared	https://www.id-city.fr/	Belgium	1	1
JenParle	Active	Multi-purpose	Cross-context	Not declared	https://en.jenparle.fr/	France	1	1
Vooter	Active	Multi-purpose	Cross-context	Not declared	https://en.vooter.co/	France	1	0
Manabalss	Active	Multi-purpose	Context-specific	Not declared	https://manabalss.lv/	Latvia	0	0
Mapseed	Active	Multi-purpose	Cross-context	Yes	https://www.mapseed.org/	Unknown	0	0
Lutece	Active	Not valid	Cross-context	Yes	https://lutece.paris.fr/lutece/what-is-lutece-.html	France	1	1
Arguman	Active	Multi-purpose	Cross-context	Not declared	https://arguman.org/	Turkey	0	1
Stanford PB	Active	Multi-purpose	Cross-context	Not declared	https://pbstanford.org/	USA	1	0
Mieux voter	Active	Multi-purpose	Cross-context	Not declared	https://mieuxvoter.fr/	France	1	0
VoteIT	Active	Multi-purpose	Cross-context	Yes	https://voteit.se/en/	Sweden	1	0
PlaceToPlan	Active	Multi-purpose	Cross-context	Not declared	https://www.placetoplan.com/	Sweden	0	0
Urbanpinion	Active	Multi-purpose	Cross-context	Not declared	https://www.urbanpinion.com/	Estonia	0	0
OpenStad	Active	Multi-purpose	Context-specific	Yes	https://openstad.org/	Netherlands	1	1

Munipolis	Active	Multi-purpose	Cross-context	Not declared	https://info.munipolis.com/	Czech Republic	1	1
Mapeo	Active	Multi-purpose	Cross-context	Yes	https://www.digital-democracy.org/mapeo	USA	0	1
Kialo	Active	Multi-purpose	Cross-context	Not declared	https://www.kialo.com/my	Berlin	1	1
CogniCity	Not active	-			https://www.cognicity.com/			
Ethelo	Not active	-			https://www.ethelo.com/			
Polltix	Not active	-			https://polltix.co/			
ActiveCtitizen	Unable to locate							
DemosX	Unable to locate							
Discourse	Unable to locate							
Hromadski Project	Unable to locate	-						
Insights	Unable to locate	-						
PartiCipate 21	Unable to locate	-						
Participare	Unable to locate							
Swarm AI	Unable to locate							
Online Deliberation Platform	Unable to locate							
The Russian Public Initiative	Unable to locate							
Virtual Congress	Unable to locate							

Zencity Engage	Unable to locate							
Mapwith.ai	Unable to locate							
CoFonder	Unable to locate							
Bien Dit	Unable to locate							

Annex II

This annex lists out all the human-to-human features and its source of the 10 selected tools. The column 'Feature category' and 'EP level'.

01 Adhocracy+
https://adhocracy.plus/info/features/

Feature	Information from webpage	Feature category	EP level
(Spatial) Brainstorming	Participants can submit their own ideas and locate them on a map. They can also discuss the ideas of others. https://adhocracy.plus/iserlohn/projects/module/brainstorming-mit-karte-125/#index	Open suggestion	Collaborate
Poll	Participants can answer open and multiple-choice questions and comment on the poll. Consult: https://adhocracy.plus/iserlohn/projects/quartiersentwicklung-heide-hombruch/ Empower: https://adhocracy.plus/iserlohn/projects/wo-soll-unsere-stuhl-ausleihbox-stehen/	Limited opinion-sharing / Decision-making	Consult / Empower
Text Review	Participants can discuss the paragraphs of a text that you added beforehand. https://adhocracy.plus/werder-havel/projects/baumblutenfest-2021ff/	Open suggestion	Collaborate
Debate Module	The participants can lead structured discussions. The contributions can be marked as suggestions, comments, or questions. https://adhocracy.plus/gemeinde-panketal/projects/module/debatte-76/	Interactive discussion	Involve
Interactive event	The participants of an event can ask their questions online. Other participants can support the question. You as the moderator can sort the questions by support or affiliation.	Real-time communication	Collaborate
(Spatial) Idea Challenge	In a first phase, participants can submit their own ideas and discuss the ideas of others. In a second phase, the ideas can be rated (pro/contra). https://adhocracy.plus/uni-hildesheim/projects/klimaschutzkonzept/?initialSlide=4#timeline-carousel	Open suggestion	Collaborate
Participatory budgeting	Participants can submit their own suggestions, mark them on a map, and add a budget. The ideas of others can be discussed and rated (pro/contra).	Open suggestion	Collaborate

Prioritization	Participants can discuss and rate (pro/contra) previously added ideas and topics. Participants cannot add ideas or topics.	Limited opinion-sharing / Interactive discussion / Decision-making	Consult / Involve / Empower

02 Argù

https://docs.argu.co/e-participation_tools.html

Feature	Information from webpage	Feature category	EP level
Community	Community is the largest and most important resource. A Community is the space where people come together and discuss things.	Information	Inform
Forums	A Forum is a (discussion) environment where people can post items. A Forum can contain different types of discussions.	Discussion	Involve
Challenges and Ideas (Incl. voting and GIS)	Within Argu, the Challenge and the Idea play an important role in the discussion structure. This structure is designed to facilitate nuanced, solution-oriented discussions. A Challenge is an issue or problem that encourages people to think along, so they can submit ideas.	Open suggestion	Collaborate
Argument	Under an idea, you can place arguments for and against it. These appear in separate columns (for left, against right), so that you can quickly see what the most important pros and cons of an idea are. Arguments can be voted up using the upvote button. The arguments with the most upvotes are shown at the top of the overview.	Discussion	Involve
Voting	On Argu you can vote on Ideas. There are three default voting options: For, Neutral, Against Everyone can vote once. A vote is only counted if the e-mail address has been confirmed.	Limited opinion-sharing / Decision-making	Consult / Empower
Swipe tools	It's like a dating app, but for voting on things! A fun way to gain insight into how popular something is. Especially useful for visual things, such as rating images.	Limited opinion-sharing	Consult
Survey	The Survey is a questionnaire that is usually completed anonymously. Use this if you want to collect anonymous, quantifiable data, and prefer not to interact/discuss.	Limited opinion-sharing	Consult

Project	A Project has a timeline, which consists of Phases. Each Phase can show a different thing. Projects are useful for engaging people over time.	Communication	Inform
Budget	Allowing people to vote by distributing a budget. Users get their own shopping basket with a certain budget, and can then add ideas until the budget is distributed.	Decision-making	Empower

03 Citizen OS

https://citizenos.com/platform/

Feature	Information from webpage	Feature category	EP level
Topics	Add text, photos, footnotes and attachments to give context and guidance to participants. Co-create your topic with others before you share it.	Information	Inform
Idea gathering	To crowdsource ideas from your group or community, start your topic with an idea gathering phase. There, participants can post their ideas, browse and reply to others' ideas, and upvote their favourites.	Open suggestion	Collaborate
Discussion	Use a discussion phase to weigh up all sides of a decision collectively. Participants can add pro or con arguments and neutral points of information. Arguments can be replied to, reacted to, or reported as inappropriate to the topic admin.	Discussion	Involve
Voting	Let everyone have their say with a vote. You can start a topic that cuts straight to the vote or add a voting phase after idea gathering or discussion.	Limited opinion-sharing / Decision-making	Consult / Empower
Action	Keep your participants updated on actions taken due to the decisions made in the final 'Action' phase of your topic.	Communication	Inform
Group	Groups are an easy way to share several topics with the same people, and keep all relevant topics in one easily accessible place.	Communication	Inform

04 CONSUL

https://docs.consuldemocracy.org/docs_general/participation-processes/citizen-proposals

Feature	Information from webpage	Feature category	EP level
Citizen proposal	The proposals module is designed to collect citizen proposals that require a specific number of "supports" to be processed.	Limited opinion-sharing / Open suggestion	Consult / Collaborate
Debate	The "Debates" module enables citizens to make visible the topics that are important to them, and to find each other to debate or collaborate around these topics. It is a space for listening, but also for meeting and discussion.	Discussion	Involve
Participatory budgeting	Allows citizens to propose and decide directly how to spend part of the institution's budget. Each person can make proposals for projects to spend the budget on and vote on the proposals of others. The proposals most voted for will be carried out.	Decision-making	Empower
Collaborative legislation	Specifically designed to organize participative processes around creating formal rules, laws or regulations. The module is also fully equipped to open any type of text to citizen contributions and, more generally, even to receive contributions to any (non-legislative) initiative that is launched by the public institution.	Discussion	Involve
Vote	The voting module allows users to vote for citizen proposals or specific questions that the institution wants to raise.	Decision-making	Empower

05 Decidim

https://decidim.org/features/

Feature	Information from webpage	Feature category	EP level
Proposal	Create a proposal using a creation wizard, compare it with the existing ones, publish it on the platform and include additional information such as geolocation or attached documents and images. This component also allows you to navigate, filter and interact with a set of proposals. In addition, with the proposal-incubator you can create collaborative proposals.	Open suggestion	Collaborate
Meeting	The meeting component offers organizations and participants the opportunity to convene meetings, determine their location and time, register and limit attendees, define the structure and content of the meeting as well as publishing the minutes, and the resulting proposals.	Real-time communication	Collaborate
Conference	Create a website for a big event. Unify the program by joining up a series predefined meetings (chats, workshops, etc.), and manage attendees.	Real-time communication	Collaborate
Sortitation	Allows to select a number of proposals (e.g. candidates for a jury) with random, yet reproducible, procedures that guarantees non-biased and uniform distributions.	Opinion-sharing / Decision-making	Consult / Empower
Accountibility	It offers the possibility to subdivide results into projects, to define and apply progress states around their implementation, as well as to show the degree of achievement of results grouped by categories and scopes.	Communicatoion	Inform
Voting	Offers organisations the possibility of activating different voting or support systems around proposals: unlimited, limited to a given threshold, weighted, cost-based, etc. Backed by secure and encrypted e-voting technology.	Limited opinion-sharing / Decision-making	Consult / Empower
Participatory text	Can be used to convert long text documents into several proposals or results and, vice versa, to compose and display a unified text based on a collection of proposals or results.	Discussion / Open suggestion	Involve / Collaborate
Comments	Enables users to add comments, to value them in favour, against or neutral, vote them, answer and receive notifications about responses.	Discussion	Involve
Pages and posts	Create informative pages with rich text formatting, embedded pictures and videos. The blog component makes	Information	Inform

	possible the creation of posts or news, and to navigate them chronologically.		
Newsletter	Send emails to everyone registered in the platform or to those who participate in a specific space.	Information / Communication	Inform
Notification	Decidim enables you to track any space or component so that you can receive updates whenever they happen.	Communication	Inform
Survey	Design and publish surveys. Display and download results.	Limited opinion-sharing	Involve
Result	Turn proposals into results and give official responses concerning their acceptance or rejection, merging various proposals into a single result.	Decision-making	Empower

06 GoVocal

https://www.govocal.com/engage

Feature	Information from webpage	Feature category	EP level
Information	Share project information in different formats (images, text, attachments, or embedded content) and write official updates to participant input, either individually or in bulk	Information	Inform
Email & Messaging	Send email campaigns and enable notifications to keep your community in the loop about new and ongoing projects.	Communication	Inform
Follow	Participants have the option to follow their preferred projects, discussions, topics, areas, and proposals to stay in the loop.	Communication	Inform
Event	Display, manage, and publicize both past and upcoming events – all on your platform.	Information	Inform
Survey (also with paper form with OCR)	Ask your community tailored questions to understand their needs and expectations better, and analyze their input efficiently with our integrated AI tool Sensemaking. Collect input from community members during offline engagement opportunities and easily digitize the data through our built-in OCR technology.	Limited opinion-sharing	Consult
Polls	Gather feedback on a specific topic to quickly understand your community's priorities.	Limited opinion-sharing	Consult
Voting & prioritisation (with discussion)	Present a set of options which community members can vote on or discuss.d expectations better, and analyze their input efficiently with our integrated AI tool Sensemaking.	Discussion / Decision-making	Involve / Empower
Option analysis	Invite your community to analyze and understand different potential scenarios before gathering their feedback.	Discussion	Involve
Document annotation	Collect feedback on your draft documents in context from residents, stakeholders, team members, and beyond.	Open suggestion	Collaborate
Ideation	Invite participants to submit ideas on various topics.	Open suggestion	Collaborate
Mapping	Collect quantitative and qualitative data in spatial engagement projects through interactive maps.	Open suggestion	Collaborate

Community proposal	Enable bottom-up participation where participants can propose their own initiatives and gather support.	Open suggestion	Collaborate
Citizens assembilies	Bring together a representative group of community members who are selected at random to learn about, deliberate upon, and make recommendations in relation to a particular issue or set of issues.	Open suggestion	Collaborate
Participatory budgeting	Invite your residents to allocate a predetermined budget among a set of options.	Limited opinion-sharing / Decision-making	Consult / Empower

07 Fluicity

https://get.flui.city/en/plateforme-consultation-citoyenne

Feature	Information from webpage	Feature category	EP level
Call for proposal	The call for proposals allows to make proposals on a chosen theme or in the framework of an "idea box", to comment and to support other participants.	Limited opinion-sharing / discussion / Open suggestion	Consult / Involve / Collaborate
Participatory budget	The participatory budget is a device that empower citizens by allowing them to allocate a defined budget to a set of proposals.	Open suggestion / Decision-making	Collaborate / Empower
Concentration	The collaborative decision is similar to the participatory budget, but the vote is carried out without budget constraints.	Open suggestion / Decision-making	Collaborate / Empower
Secure vote	Fluicity allows for identity verification in order to better orient users and to ensure that participation is limited to a target population, typically all the inhabitants of a territory.	Decision-making	Empower
Cartography	The user can identify the essential information concerning the proposals, and access the details of the proposals directly from the map. The user can also create a proposal directly from the map.	Open suggestion	Collaborate
Neighborhood management	This module allows you to submit participatory devices for sub-groups, such as neighborhoods within a municipality or themes for other organizations.	Communication	Inform
Dashbaord	This module allows you to submit participatory devices for sub-groups, such as neighborhoods within a municipality or themes for other organizations.	Information	Inform

Study	Surveys allow you to conduct simple surveys or in-depth studies on your participation platform.	Limited opinion-sharing	Consult

08 LiquidFeedback

https://liquidfeedback.com/en/how-does-it-work.html

Feature	Information from webpage	Feature category	EP level
Create an initiative	Create an initiative to tell others what you want to do. An initiative is an idea or proposal that comes with a rationale.	Open suggestion	Collaborate
Support an initiative	After looking at the different initiatives, support the ones you like. This way you show the author (or initiator) how popular his initiative is.	Limited opinion-sharing	Consult
Suggest improvement	Participants can also suggest improvements to initiatives while indicating how important they are—whether they "should" or "must" be adopted.	Open suggestion	Collaborate
Alternative initiative	If you disagree with an initiative, you can propose an alternative or a counter-proposal. You can also wait until voting begins to reject the initiative.	Discussion	Involve
Vote	LiquidFeedback provides a preference voting system that allows users to not only vote yes or no, but also to indicate preferences such as favorites and second choices.	Decision-making	Empower

09 YourPriorities

https://citizens.is/your-priorities-features-overview/

Feature	Inform from webpage	Feature category	EP level
Online idea generation	Enables groups of any size, public or private, to come together to find great potential solutions.	Open suggestion	Collaborate
Deliberation solution	Citizens add points for or points against each idea. They can then vote the debate points up or down, but they can't comment directly on them – they will have to write standalone counterpoints.	Discussion	Involve
User inputs	You can configure Your Priorities for the simplest or the most complex inputs from citizens. You can use simple surveys as a part of idea generation or complete surveys with features like skip questions & rich text	Limited opinion-sharing	Consult
Rating system	The platform routinely uses hearts, arrows, hats & thumbs for vote up and/or down functionality.	Limited opinion-sharing	Consult
Social media intergration	Users easily share content on other platforms, with details like uploaded image sizes designed to work well when shared on other social media platforms.	Communication	Inform
Notification system	For regular users and administrators, a range of different types of notifications can be configured to be turned off, be delivered to the browser only, or both browser and emails.	Communication	Inform
Newsfeed	These feeds act as activity updates for all levels of deliberation and function as social media feeds where users can post links with comments. This feature enables users to collect outside references to ideas and communities and works similar to a Facebook "wall."	Communication	Inform
Participatory budgeting	Your Priorities integrates tightly with Open Active Voting, our secure and gamified budget voting solution.	Decision-making	Empower
Your priority realtime	Our Your Priorities real-time meeting platform allows selected groups of service providers and service users to come together regularly to help improve public services.	Communicate	Inform

10 Empatia

https://empatia-project.eu/tools/

Feature	Inform from webpage	Feature category	EP level
Participatory budgeting	Participatory budgeting (PB) represents one of the most successful civic innovations of the last quarter-century. PB is a family of participatory processes with many variations. In the most extensive format PB includes: Ideation, Filtering, Voting, Monitoring	Limited opinion-sharing / Open suggestion / Decision-making	Consult / Collaborate / Empower
Ideation	Continuous ideation processes allow people to submit ideas to a municipality at any time. These processes are different from other participatory processes, such as PB, that have a fixed cycle. The participants are invited to rank the top ideas, in turn, reducing the amount of time required to filter feasible ideas by the municipality.	Open suggestion	Collaborate
Monitoring	The EMPATIA project has developed tools to support the monitoring of PB cycles (also referred as 2nd cycle).	Communication	Inform