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

D2.2 - URBREATH methodological framework for urban greening Living Labs and hybrid/ NBS interventions and adaptive pathways - V2

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Document description	The deliverable is the second version of Deliverable D2.1 - URBREATH methodological framework for urban greening Living Labs and hybrid/NBS interventions and adaptive pathways – V1. This deliverable focuses on the different processes that have been performed within the first two years of the project, and it highlights the following workstreams: • Co-creation activities: emphasise the cross-collaboration among cities and partners, enabling information collection and task performance, with the use of Service Blueprint, Mindmaps and World Cafè Research. • Living Labs: Environments where different stakeholders collaborate to develop, test, and refine innovative solutions in real-life settings (e.g. digital tools, and NBS design and implementation). • Adaptive Pathways, where the cities map all their risks, not only natural hazards, but also institutional ones, from a short-medium and long-term analysis, and design adaptive pathways based on actions and solutions they may perform. • Replication Plan, between Frontrunner Cities, which are working on NBS implementation on their pilot sites, and Follower Cities which 'acquire' the Work-Plan and adapt it to be their Development Plan for NBS planning in the pilot. • Public Procurement Model, which helps Frontrunner Cities in carrying out the NBS procurement, based on an URBREATH model (drafted from the EC Regulation) and their traditional and ordinary practices. This deliverable, the second of three releases, is a "living document", with methods and tools updated as the project progresses. The methodology is experimental and will integrate future tasks and results.

Document Revision History

Version	Date	Modifications Introduced	
		Modification Reason	Modified by
V0.1	5th May 2025	Review of the TOC for the second release, and re-organisation of the contents accordingly	POLIMI
V0.2	2nd June 2025	Re-organisation of the Annexe on 'Benchmarking of e-participation platforms'	POLIMI
V0.3	30th June 2025	Writing additional sub-sections in Chapter 2.2 (i.e., 2.2.3 'Mind Maps'; 2.2.5 'World Research Cafè'; 2.2.7 'RIBA Plan of Works')	POLIMI
V0.4	7th July 2025	Writing additional sub-section in Chapter 2.2: 2.2.6 'Adaptive Pathways'	POLIMI and FRAUNHOFER
V0.5	30th September 2025	Writing Chapter 2.3 'Application of the methodology', including sub-section: • 2.3.4 'From URBREATH toolbox requirements to the contextual and local URBREATH toolbox'. • 2.3.5 'NBS Deployment: implementation Plan for FRCs and Development Plan for FLCs'.	POLIMI
V0.6	20th October 2025	Writing Chapter 2.3 'Application of the methodology', including sub-section: • 2.3.3 'Adaptive Pathways: from scenarios and their potential risks to action and solutions towards Cities Pathways' • 2.3.6 'Public Procurement for NBS provision in FRCs and Business Plan for the FLCs'	POLIMI, FRAUNHOFER AND SPG
V0.7	30th November 2025	Integration of information by responsible partners in Chapter 2.3	POLIMI, VLO, CA, SPG, FRAUNHOFER, TAL, ENG
V0.8	5th December 2025	Final Draft sent to Internal Reviewers	POLIMI
V0.9	12th December 2025	Reviewed Draft version	FRAUNHOFER and DML
V0.10	16th December 2025	Final Version sent to the coordinator to be approved	POLIMI
V1.0	17th December 2025	Final quality check by the Coordinator	LC
V2.1	17th December 2025	Minor review completed	POLIMI
Final	18th December 2025	Version ready for submission to the EC portal	LC

Disclaimer

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

Executive Summary

The main objective of this deliverable is to update the methodology of the URBREATH project from its first release submitted in M15.

This second release has been significantly reorganised from the previous one, and it focuses on two main elements:

- Outlining the different methods and tools used and developed to achieve specific goals, based on a literature review, and framing it within the broader domain of replicability in URBREATH project.
- Describing the different workstreams that have used and applied the methods and tools collected in the methodology, also including the main methodological principles.

The URBREATH methodology describes how the consortium frames and designs its collaborative work, focusing on six essential workstreams defining all the activities (with related methods and tools) performed in the first two years of the project (M1-M24):

Setting the basis of the project, which was already described in the previous version of the Deliverable (ref. D2.1 - URBREATH methodological framework for urban greening Living Labs and hybrid/NBS interventions and adaptive pathways - V1), and focuses on setting the main elements and the backbone of all the activities in the different WPs: from the digital tools, to the Living Labs co-creation processes; from the pilot sites' needs to the implementation or the planning of the NBS identified.

- **Local Living Labs organisation**, which includes workshops, one-to-one meetings and Cities' exchanges concerning the organisation of the Local Living Lab in each pilot site. It considers stakeholder mapping, participatory processes and ambitions, and citizen science
- **Adaptive Pathways**, which focuses on risk mapping, with related actions and solutions to be taken into account for the short, medium and long-term, and identifies potential pathways to reach specific Cities' objectives, optimise positive impact and co-benefits.
- **Design of the URBREATH Toolbox and its customisation**, which is derived from the activities done with the service blueprint and includes one-to-one sessions with the cities to better understand their needs, and Demo Cafès sessions to showcase the different functionalities of the Toolbox to be developed and customised for the Cities.
- **NBS Deployment and Planning**, which considers the implementation of the NBS in each Frontrunner City using the RIBA Plan of Works, and the replication plan for the Follower Cities, enabling peer-to-peer learning and mutual exchanges.
- **Public Procurement Model**, which focuses on the traditional and actual procurement process of the Frontrunner Cities, and relates it to an *ad hoc* model, enabling comparison and highlighting opportunities and challenges.

This Deliverable is the second 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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List of Terms and Abbreviations

Abbreviation	Definition
AI	Artificial Intelligence
AP	Adaptive Pathway
CZ	Climatic Zone
DAPP	Dynamic Adaptive Policy Pathway
DT	Digital Twin
EU	European Union
FLC	Follower City
FRC	Frontrunner City
ICT	Information and Communication Technologies
IT	Information Technology
WP(s)	Work Package(s)
LLL	Local Living Labs
M	Month
NBS	Nature-based Solutions
SB	Service Blueprint

1 Introduction

Over the past decade, there has been a growing focus on sustainable urban development within the European Union (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 accelerating urbanisation, 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 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. URBREATH embodies a dual nature that challenges conventional approaches to theory and practice, as will be explained in the following paragraphs.

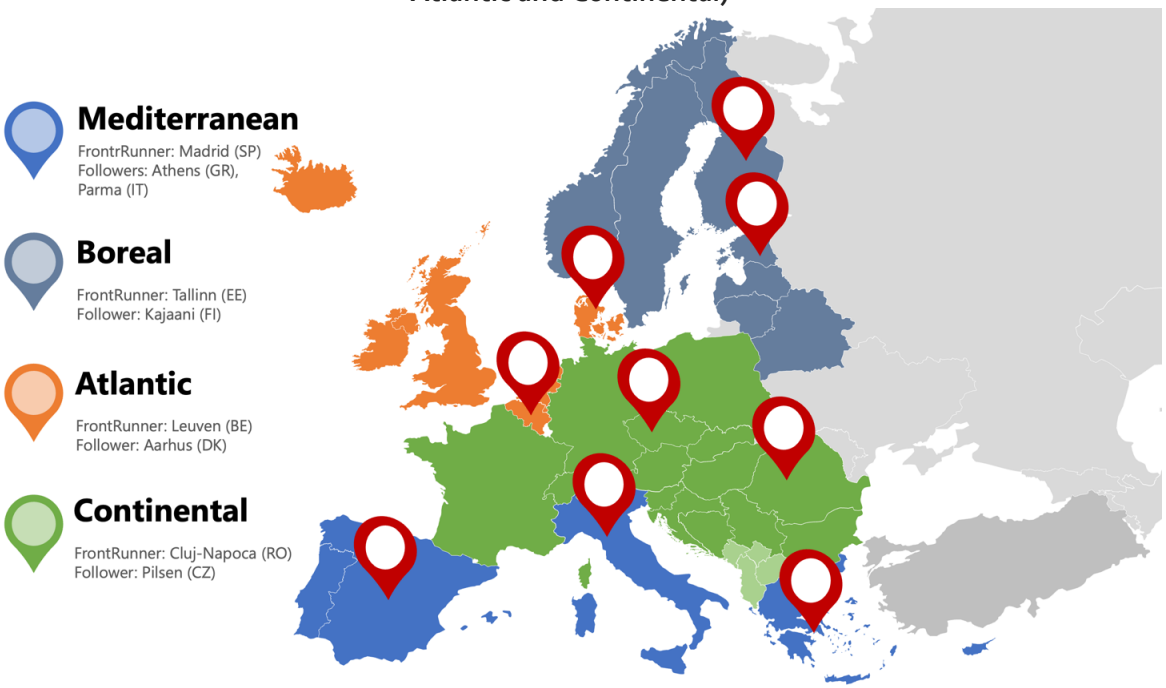
1.1 Project objectives

URBREATH aims to develop and implement the European Commission's aspirations for hybrid solutions and climate adaptation, with 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 zones (CZ). 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 FRCs is coupled with at least one FLC, and Figure 1 shows the internal subdivision among the identified climate areas.
The cities located in different climate zones encounter distinct climate challenges and hazards; this diversity facilitates knowledge exchange between FRCs, which are more advanced in NBS and smart technology development, and FLCs, which are comparatively less mature and smaller in scale. 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 private sector representatives) 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: Frontrunner 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 FRCs and FLCs pilot areas, including the implementation of NBS, with experimentation and simulation of use case scenarios using Digital Twins (DT), and participatory processes and citizen engagement via e-participation tools. At the same time, the Local Living Labs (LLLs) enable testing and validation of the URBREATH digital toolbox and decision-making related to the implementation of the desired NBS.

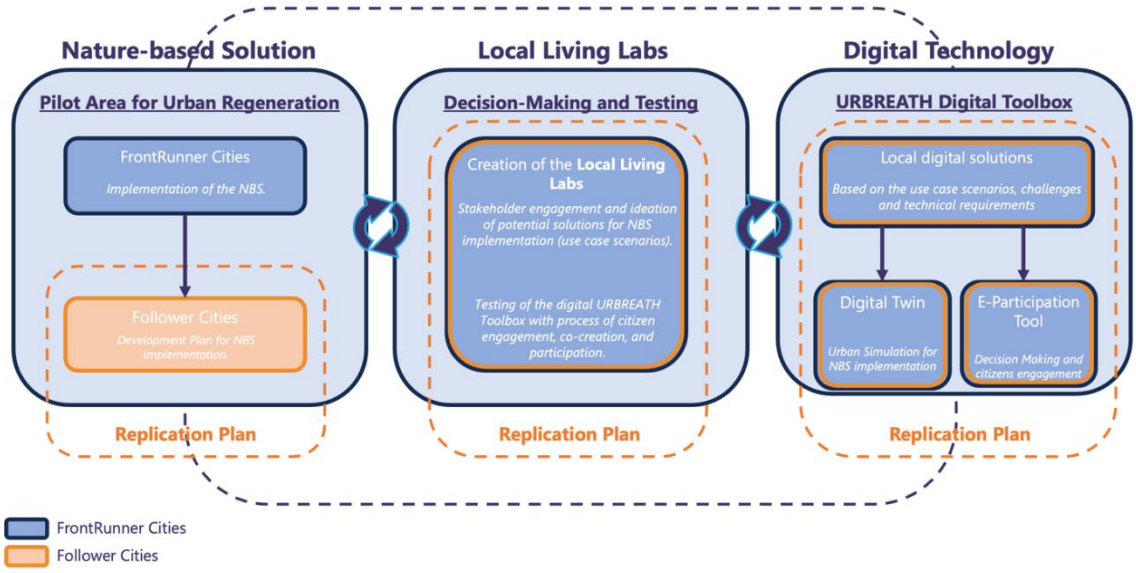
The pilots are chosen to experiment with NBS implementation, climate adaptation, and urban regeneration in specific areas of the city that face notable natural hazards. The selected areas serve as the locations where experimentations will take place. The kind of testing relates to:

- **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.
- **The creation of Local Living Labs (LLL) 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 LLLs 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: it is essential to relate the pilot areas to the digital solution, and vice versa.

Figure 2 shows the 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 the orange layout in Figure 2[1]). 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.

1 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.

Figure 2: Scheme of the three main pillars of the URBREATH project with their integration and relations.



Credits: Elaboration by the authors.

URBREATH includes the creation of a methodological framework for developing innovative standardisation and applying co-creation processes towards 'eco-unifying mechanisms'[2] (Ochoa-Hueso, 2021). URBREATH aims to promote a synergistic use of hybrid solutions and NBS, among other interventions, empowering 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 provide knowledge and expertise on urban planning challenges, particularly in the areas of 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 DT. Civil society and cities acts as the connecting link between government, the private sector, and society to ensure that their needs are 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 Figure 2).

[2] 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).

1.2 Deliverable Purpose and Structure

This Deliverable 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 private sector, it remains relatively new in public services context, particularly those related to urban planning, transformation, and regeneration.

This document is structured into three 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 details the URBREATH methodology, beginning with its rationale, including its specificities and inspiring principles (Section 2.1). It then moves to detail, presenting all the methods and tools that have been used and employed to activate co-creation sessions, in-person workshops, and other exchanges between City and non-City partners (Section 2.2). Section 2.3 describes all seven workstreams that have been the main focus of the first two years interactions, including:

- The investigation and validation of the baseline and scenarios, enabling the consolidation of the pilot site, and the needed digital requirements to be included into the URBREATH Toolbox (Subsection 2.3.1).
- The activation of the Local Living Labs in each of the nine cities, to enhance co-creation and to start, on the one hand, a discussion about the pilot site and its development while, on the other hand, start testing the digital solutions provided by the technical partners (Subsection 2.3.2).
- The work on Adaptive Pathways, which focuses on the risk-mapping for the long, medium and short run of the cities, and design specific adaptive pathways for each city considering their actions and solutions in operational terms, and impact and benefits from an institutional perspective (Subsection 2.3.3).
- The preparation of the customised URBREATH Toolbox, and all the work that technical partners have performed with the cities, enabling interactions and exchanges and strengthening the co-creation of the local Toolbox (Subsection 2.3.4).
- The preparation of the Plan of Work for the NBS implementation in the Frontrunner Cities, and the design of the NBS Development Plan for the Follower Cities, which highlights the replicability of specific tools and methods, and ensures peer-to-peer exchanges and learning by doing principle (Subsection 2.3.5).
- The public procurement analysis and model, which although specifically designed for Frontrunner Cities give the opportunity to Follower Cities to learn from advanced contexts how NBS are procured and which are the main components of the process to be held (Subsection 2.3.6).

[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.

Section 3 describes further activities and next steps for finalising the URBREATH methodology and make it more exploitable and replicable.

Differently from the previous release of the methodology (D2.1 - URBREATH methodological framework for urban greening Living Labs and hybrid/NBS interventions and adaptive pathways – V1, submitted in M15), this second version is structured giving major importance to the activities and their related tools. However, the relevant analysis of the benchmarking, as it was still an important input for the work operated in WP4, is included into a dedicated Annexe (**Annexe I – Benchmarking of e-participation platforms**). The illustrated benchmarking activity serves as a starting point for assessing the key features the URBREATH e-participation platform must have. It sets the preconditions on which technical partners will develop and deploy the URBREATH platform. It serves as a starting point for assessing the key features the URBREATH e-participation tool must have. It sets the preconditions on which technical partners will develop and deploy the URBREATH Toolbox[4].

This deliverable, D2.2, releases the second 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 a third version of the URBREATH methodology (ref. D2.3 - URBREATH methodological framework for urban greening Living Labs and hybrid/NBS interventions and adaptive pathways - V3, M36), which will update D2.2[5]. This means that this document, especially **Section 2.3**, is a living document and will be revised and validated at the end of the third year of the project.

In this second 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 (**Subsection 2.1.1**).

[4] 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.

[5] Deliverable D2.2 is already an update from D2.1, submitted in M15.

- 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 (**Subsection 2.1.2**).
- 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 (**Subsection 2.1.3**).
- 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 **Subsection 2.1.4**).

Furthermore, D2.2 includes the main activities that have been performed within the first two years of the project (M1-M24). As a living document, the main activities will be updated in the following release with more information and more tools or methods employed.

2 URBREATH methodological framework

This section introduces the URBREATH methodological framework, 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. This chapter explores the four methodological principles that structure the overall methodology (Section 2.1), and identifies a suite of methods and tools (Section 2.2) employed across the different workstreams (Section 2.3).

2.1 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) but 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 workstreams for various purposes.

2.1.1 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[6]).

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. One example is related to stakeholders mapping, where the insights gathered from each city partners are shaped by their cultural and institutional contexts, which influence decision-making within their administrative and socio-economic environments. In the first methodological phase, stakeholder mapping helps identify stakeholders (or users) affected by the URBREATH Toolbox (see D2.5 - URBREATH Platform Requirements) and their needs. 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.

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 2.1.2**, and to adapt them based on each city's level of maturity. Additionally, these modules are cross-Work Packages (WPs), meaning they can be deployed at different stages of the process (e.g., a preparation and peer-to-peer learning workshop in early March 2024 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).

[6] 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.

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, see **Section 2.3.5**)[7]. 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.

2.1.2 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 WPs. The four steps are jointly performed considering the three basic learning principles (see **Section 2.1.3**).

Step one: Preparation. This step involves analysing best practices by gathering established co-creation methodologies and tools (e.g. ENoLL toolkit[8], SISCODE[9] and UnaLAB[10]) 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.

[7] 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 are performed in the Frontrunner Cities with the Plan of Work (see Subsection 2.3.5).

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

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

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

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 (see **Section 2.2**). These processes are designed to collect information from 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.[11] 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 level of Tasks or Work Packages). The scaling deep/in/out enables the transfer of knowledge and enhances 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 of the URBREATH Methodology, serving as a guideline for analogous processes in co-creation, citizen participation, NBS deployment and

[11] The difference among these three 'scaling' mechanisms are described as follows:

- **Scaling Deep:** Focuses on changing values, mindsets, and culture to create lasting, meaningful impact. It's about transforming how people think and behave, which is essential in co-creation processes and institutional changes in the long-term.
- **Scaling In:** Strengthens internal capacity and relationships within an organisation or community. It builds resilience and collaboration before expanding outward, which emphasises the different resources and knowledges in the project.
- **Scaling Down:** Reduces scope or intensity to make an initiative more manageable and sustainable. It prioritises and simplifies the processes to reach replication, highlighting the main concepts and elements.

implementation, as well as the development of digital tools for urban decision-making, simulation, and social inclusion.

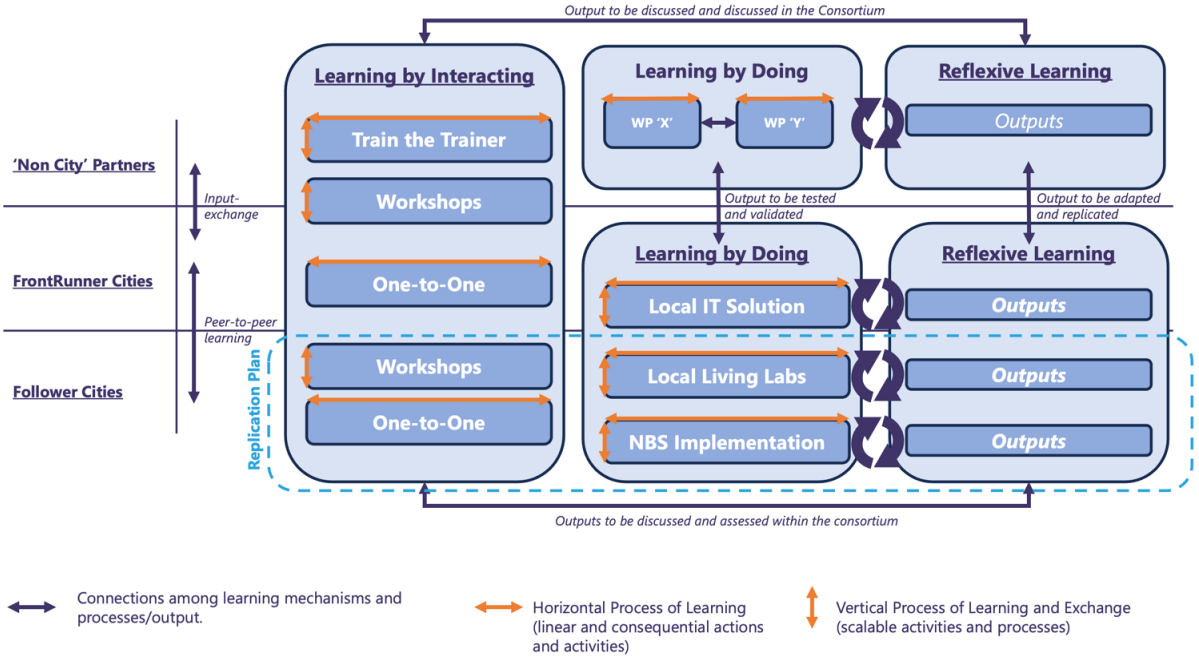
2.1.3 Knowledge flows: learning by doing, learning by interacting, and reflexive learning

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 orange arrows 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 by 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 engaging with real urban challenges, generating insights through direct experience. The co-creation process is related to a set of methods and tools (see **Section 2.2.1**), 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[12] and WP5[13]'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 **definition of the Adaptive Pathways**, which relates to the activities of designing different trajectories and action planning for ensuring higher impact and benefits for the mapped risks in the short, medium and long-term.
- The **definition of specific local digital requirements** of the cities, co-created together with the continuous support and help of the technical partners. Furthermore, using tools and activities like the 'Train the Trainer' sessions and Demo Cafès, the Cities have the chance to gain expertise and learn how to use the digital tools and the URBREATH toolbox and DT.

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[14], and WP5)[15]. 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

[12] WP2 - 'URBREATH systemic approach for co-creating urban greening and renaturing solutions' aims at providing the methodology that will be employed in the entire project. It specifically focuses on: (i) elaborating a methodological framework and tools for co-creation; (ii) supporting all the project co-creation activities in the different WPs.
[13] WP5 – Local Living Lab aims at ensuring solutions, methods and approaches employed at the local level to create a dynamic arena for evaluation and customisation. It explores feedback loops with the technical WPs (namely WP3 and WP4), and enhance activities in WP6, realted to the NBS implementation, and those in WP7 related to scaling deep, in, out.
[14] WP4 – URBREATH decision making framework. This WP aims at delivering a set of tools and the URBREATH technical solution for end-users to codesign and co-create the NBS to be implemented in the city/district.

[15] 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 – Use Case Scenarios and Baselines, submitted in December 2024) 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 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 have been released in June 2025 (Deliverable D5.1—Local Baseline State and URBREATH Revisited Requirements and Technical Framework, V1).

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 is 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 the methodology' (and replication models) based on Frontrunner Cities' learning experiences, enabling contextualisation, minimising risks, and optimising tasks and activities[16].

2.1.4 Experimentation: Cross-disciplinary and cross-scaling collaborations

Together with a flexible, modular, and scalable structure (Subsection 2.1.1), a four-step process (Subsection 2.1.2), and a set of knowledge flows (Subsection 2.1.3), the URBREATH methodology emphasises the experimentation of formats, methods, and tools across disciplines and application contexts. Experimentation (Subsection 2.1.4) 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., DT 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, that could be the basis for replication and usability in different cities and contexts.). Throughout the project, information is processed and elaborated, moving from a local

[16]As an assessment method, reflexive learning has played a key role alongside the whole process in evaluating activities, fine-tuning approaches, and shaping collective and joint tasks. In Subsection 2.3.4 and Subsection 2.3.5 this reflexive process is also highlighted by the continuous monitoring and update from the Cities on their activities on the NBS implementation (FRCs) and Planning (FLCs).

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. The 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 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[17]. 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).

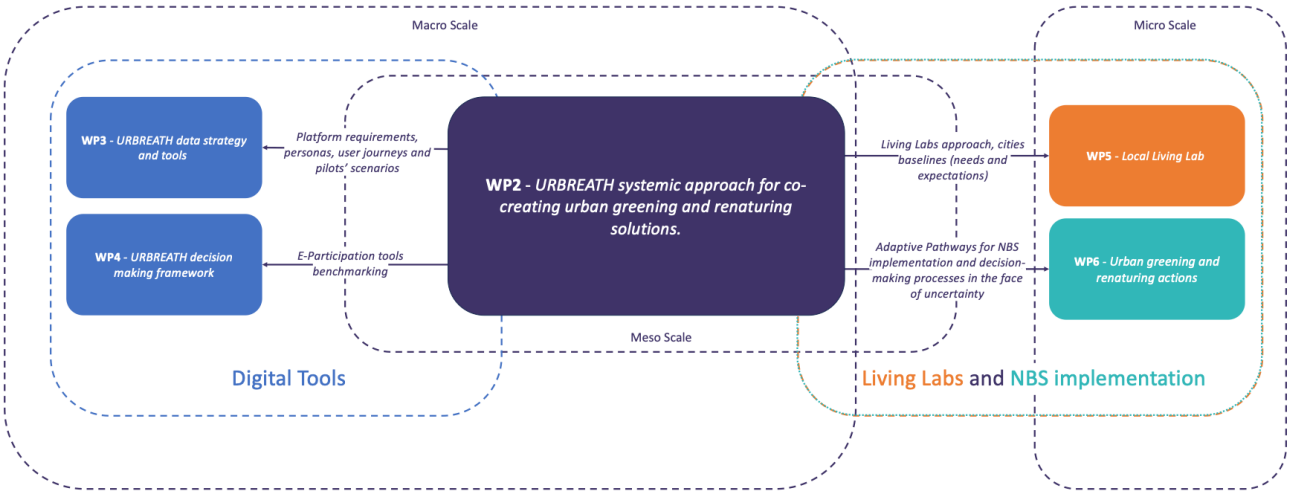
The three scales are essential for two key reasons. First, operating at different scales enables a comprehensive understanding of the phenomenon's granularity. This approach spans from the European scale (macro), which allows for generalisation of outputs, to local contexts (micro) that highlight the 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 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

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

(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 WPs, 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.

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



Credits: Elaboration by 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).

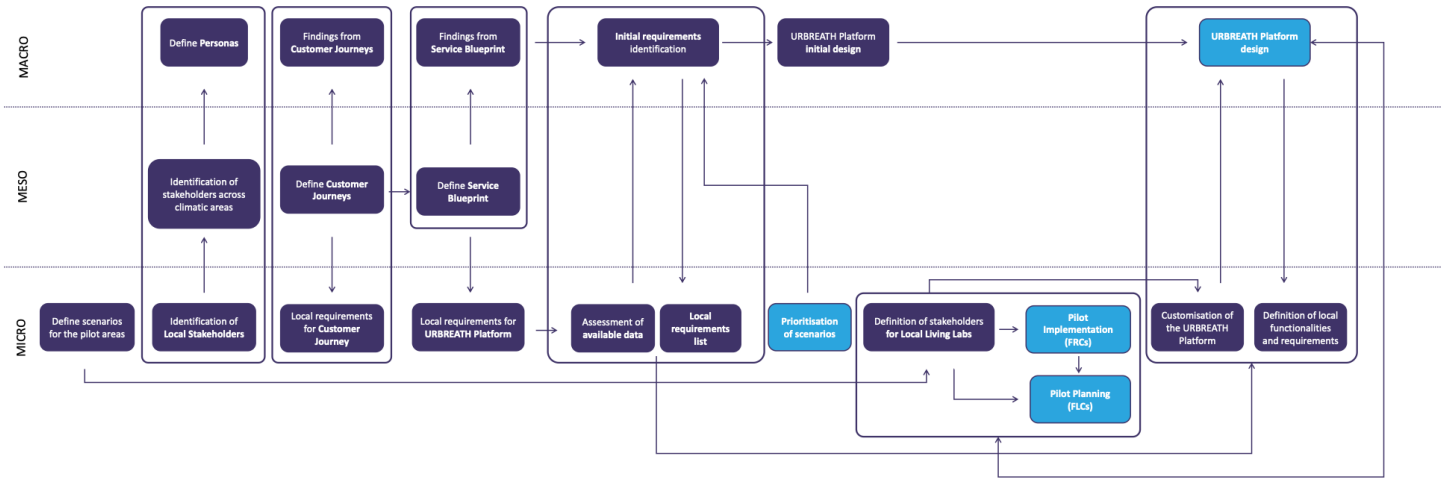
Cross-Work Packages Collaboration. The experimentation at three different scales is essential for the composition of the URBREATH methodology, as well as for the internal organisation of the consortium among WPs and related Tasks. To recall the structure of the project and its WPs, there are three main scales from which the project would provide innovative and creative solutions (see also Figure 5):

- 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[18].

[18]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 lead 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.

Figure 5: 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.



Credits: Elaboration by the authors.

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 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.

2.2 URBREATH methodological framework: collection of methods and tools

After considering the inspiring principles of the URBREATH methodology, the following section outlines the methods and tools employed in the project so far. As previously mentioned, the URBREATH methodological framework aims to design a comprehensive structure for achieving specific results and objectives within the URBREATH project. At the same time, this methodological framework is designed to be replicable and adopted in different contexts and for different purposes.

To achieve this goal, the URBREATH methodology lies in the combination of various methods and tools (see **Section 2.3**), primarily adapted from the service and participatory design domain, to deliver a blueprint for the implementation and use of the URBREATH Toolbox, and then for all the activities for designing participation processes through the Living Lab approach, and for implementing and planning NBS in the pilot sites of each City.

Building on the aforementioned principles and domains, the URBREATH methodology operates within a highly complex framework, involving multiple steps and numerous interactions among partners, which are essential for learning methods, and 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, it is essential to highlight that all operational tools and methods that have been employed and utilised in the steps and across the second year of the project, differently from the first release of the methodology[19], are based on consolidating the practices and workplans throughout the project. The 'testing' exercise has been validated and progressively implemented, adapted and enhanced during the second year of the project[20], and it serves as a collaborative methodological framework enabling and strengthening the four principles of the methodology (**Section 2.1**). This exercise is crucial in delivering replicable tools to be used for different purposes and in different contexts.

Overall, the methodological framework includes two main sets of tools and methods. On the one hand, there are the **'operational tools'**, that are frequently used to enhance online and offline activities (e.g. workshops and one-to-one), and that support the discussion and the collection of data and information (e.g. questionnaires and service blueprint canvases). On the other hand, there are sets of **methods and approaches** used for achieving specific purposes and supporting the project in achieving specific results.

[19] In the first release of this Deliverable D2.1 - URBREATH methodological framework for urban greening Living Labs and hybrid/NBS interventions and adaptive pathways – V1 (M15), the main objective was to test these tools and see their effectiveness in delivering valuable results.

[20] The validation and the adaptation of methods and tools have been made based on the outcomes and outputs that were achieved during the different sessions and activities.

The **'operational tools'** are briefly explained and described as follows:

- **Workshops** aim to create an interactive discussion on specific topics. 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 pilot 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[21].
- **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 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.
- **'Demo Cafès' sessions** are specifically designed to showcase the different functionalities of the URBREATH Toolbox, and it is used to enhance the discussion between technical partners (mostly involved in WP3 and WP4, see **Subsection 2.3.4**) and Frontrunner and Follower Cities. This tool helps, on the one hand, to set internal milestones for the technical partners to develop their specific digital tools to be used and integrated into the general digital tool of URBREATH and, on the other hand, it serves as an assessment tool for the cities to be aware of the tools and functionalities they are going to have visualised and usable on their specific local platforms, giving them the possibility for customisation, based on their specific needs.
- **Stakeholder mapping**, which is used in different workstreams and that facilitates the identification of the main stakeholders (from different domains, e.g. public administrations, experts and professionals; citizens; private companies and developers, NGOs, ...) that can

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

enhance the NBS development process. This investigation served as a background for defining the first six personas designed for structuring the preliminary version of the URBREATH Toolbox (Deliverable D2.5 - URBREATH Platform Requirements see also Subsection 2.3.1); it was also used and integrated to have a broader overview of the relevant stakeholders to be included in the creation and organisation of the Local Living Labs, following the quadruple helix approach (see Subsection 2.3.2).

- **Miro Boards,** which serves as a collaborative tool to better interface with the cities during online workshops and one-to-one meetings. The Miro Boards are organised to facilitate the discussion among the partners of the consortium, and the cities and are used to collect a variety of information, also enhancing peer-to-peer learning between Frontrunner Cities and Follower Cities.
- **Presentations** have a twofold aim. On the one hand, this tool serves as a support for partners (both city and non-city partners) to present ongoing work; on the other hand, it is used for introducing activities and relevant information and as a co-creation tool (e.g. in the case of Living Lab activities and Train the Trainer sessions). Presentations are also favouring cross-Work Packages collaboration and give the possibility to combine more than a single input in specific and dedicated sessions (for example, those discussed in Subsection 2.3.1 and Subsection 2.3.5)
- **Excel Spreadsheets**. Similarly to 'presentations', the excel spreadsheet are used to gather data and specific requirements, especially concerning the collection and clusterisation of the URBREATH requirements (Deliverable D2.5 - URBREATH Platform Requirements see also Subsection 2.3.1) and their further customisation (see Subsection 2.3.4). They are also employed to collect datasets and useful information to create the KPIs catalogue – *before* and *after* – and in general they serve as a tool for categorisation. Roughly, the Excel spreadsheet is essential for the categorisation of datasets and digitalised data which enables the technical partners to streamline and cluster information to be further deployed into specific functionalities.
- **Questionnaires** are used to gather information from Frontrunner and Follower cities with regards to specific domains (e.g. planning matters, public procurement practices). The semi-structured questionnaires are an important tool for deep dive into specific information, and facilitate cities to get the related answers being prepared and/or reach out to the experts. This tool is used both as a preliminary investigation on specific topics (e.g. Green Investment Plan), and for detailing and deepen ongoing analyses (e.g. in the case of public procurement, see also Deliverable D6.7 - Procurement and city preparation for NBS intervention – V1, submitted in M24, see also Subsection 2.3.6).
- **Service Blueprint Canvas** 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; see also Subsection 2.3.1) 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 meetings). It also empathises with the role of the user and their experiences.

- **Public Procurement ideal Model**, which serves as a basis for Frontrunner Cities to understand whether they are aligned with the EU regulations (in this regard, and for more information on this topic, please refer to Deliverable D6.7 - Procurement and city preparation for NBS intervention – V1, submitted in M24, see also **Subsection 2.3.6**). The model is a guide to understand public procurement processes already existing and performed in the pilots (FRCs), and it is a first step to standardise the process for NBS implementation.

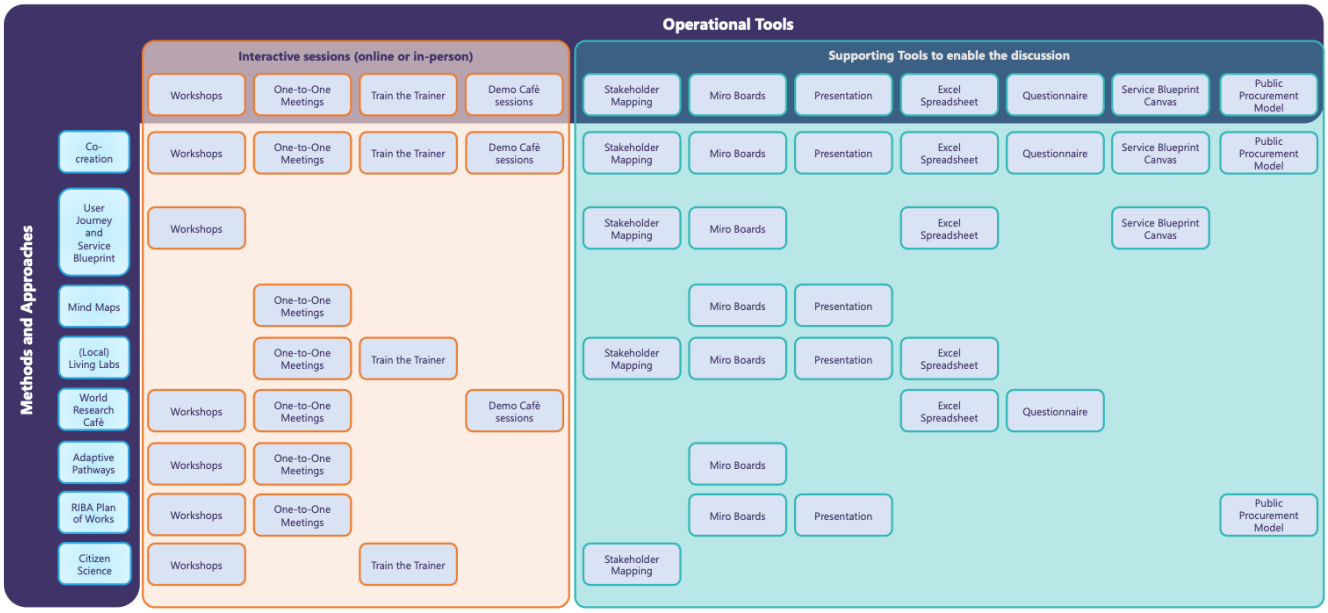
All these tools have been integrated into different steps across the project (see **Section 2.3**), to co-produce knowledge and assess objectives. As mentioned, these operational tools have been adapted, employed and combined in different workstreams, and they serve as a practical toolkit to be adopted within different approaches and methods. It has to be noted that these operational tools are also following the four principles of the methodological framework (i.e. structure, process, knowledge flow, experimentation, see **Section 2.1**). In the URBREATH project, these operational tools have been adopted in heterogeneous methods, approaches and theoretical tools, namely:

- **Co-creation sessions**, enabling participatory processes and the progressive and constant design and production of collective knowledge.
- **User Journey and Service Blueprint**, taken from the domain of service design, which serves as a method – with the specific tools – to better understand relationships among digital tools, its functionalities and the user experience.
- **Mind-maps**. Another essential tool from the participatory process theory, which enhances qualitative analysis and collective knowledge visualisation for supporting collaborative decision-making.
- **(Local) Living Labs**, which are real-world experimentations where different stakeholders test and validate innovation solutions in a collaborative way to develop and integrate more practical and contextual solutions and outcomes.
- **World Cafè Research**, which enables the showcasing and demonstration of specific outputs and enhances collaborative dialogue between service provider and users in a more informal way, enhancing and supporting qualitative inputs.
- **RIBA Plan of Works**, designed and adopted in architecture and landscape design, to better frame and organise the implementation of a specific project, focusing on different aspects of the project itself (e.g. costs, sustainability, inclusion, ...).
- **Citizen Science.** Similarly to mind-maps and co-creation processes, citizen science contributes enhancing qualitative analysis and citizens' perspective towards collection of inputs and data.

The next sections are devoted to describing, from a theoretical perspective, which are the main components and features of these approaches, methods and tools. It helps to define and understand the foundation of the tools and how they are used and employed to reach specific objectives and goals

of the project. Figure 6 briefly shows how these operational tools are combined and used in the different methods and approaches. The operational tools have been clustered into 'interactive sessions', which are basically those where all partners gather and work together for collective exchanges, and 'supporting tools', which are those used for facilitating the interaction and the collection of inputs.

Figure 6: Structure of the methodological framework highlighting the operational tools and the different methods, approaches and domains where they are used.



Credits: Elaboration by the authors.

2.2.1 Co-creation process

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., 2014). 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.

Co-creation sessions in URBREATH are essential for fostering collaboration among consortium partners. They support, for example, the definition of use case scenarios, the implementation plans for Frontrunner and Follower Cities through workshops and one-to-one meetings, enhancing peer-to-peer learning and joint development. Overall, co-creation sessions can be considered the main approach and process for the composition of the whole URBREATH methodological framework.

2.2.2 User Journey and Service Blueprint

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 (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).
Considering the work by Bitner et al. (2008) the main components of a SB are five:

- *Customer actions*, which includes all the steps the customers – or the users – take to deliver and assess the service provision. In this case, all the steps taken by the customer are relevant as they enhance the co-creation of the service itself. This activity is strictly related to the individual activity of the specific customer.
- *Onstage/visible contact employee actions*, which relate to the interactions between the customer and the service provider (contact employee). In this case, it is essential for the validation or confutation of the service that has been provided.
- *Backstage/invisible contact employee actions*, are considered as all the actions and activities that are not directly visible by the customer, but are taken into account by the service provider to make sure that all the needs and requests are met.
- *Support process*, which is the process enabling the performant provision of the service and relies on activities and processes that are essential to grant it. It includes backstage and onstage activities and is related to the process of supporting and enhancing the final experience of the customer.
- *Physical evidence*, which is considered all the tangible aspects of the product that customers are exposed to, and that may influence their quality perceptions.

In recent years, this idea of the five different steps has been enhanced by the 'online-to-offline' approach (the 'O2O', see Ryu et al., 2020), where the integration of both online and offline activities between customers/users and the service providers may enrich the quality of the product. In this case, the final users can obtain more information about the service and combining online and offline activities can provide a better experience, thereby improving the service quality. It also enhances cooperation in handling customers' needs and requirements.

The URBREATH methodology uses the SB as a tool to design and organise the project's Toolbox, primarily for Frontrunner and Follower Cities (see Deliverable D2.5, submitted in December 2024). It facilitates communication between technical partners and city users, supported by co-creation sessions, workshops, one-to-one meetings, and the 'Demo Café'. The SB process employs Miro Boards to enable co-creation, interaction, and peer-to-peer learning between Frontrunner and Follower Cities within the same Climatic Zone.

2.2.3 Mind-Maps for Co-creation Processes and Stakeholder Engagement

The tool of mind-maps (firstly introduced by Tony and Barry Buzan, 1993), or concept maps (see Novak, 1998), derives from the importance of better understanding qualitative research. Mind-maps are essential in analysing and demonstrating how people, and more generally, research groups, visualise relationships among different domains and topics (Lanzing, 1996; Wheeldon and Faubert, 2009; Wheeldon, 2011), and they also allow the focus on meaning, and perceptions (Daley, 2004). Mind-maps are frequently used in participatory processes and community engagement processes, as they highlight the possibility of disentangling 'complex issues' - such as those of urban planning and participatory

processes and co-creation - into more user-friendly forms and making certain intangible issues or items more tangible (Morelli et al., 2021; Zohar et al., 2023). Overall, considering participatory processes and co-creation approaches, the tool of mind-maps can be used as a way to either 'inform' or 'collaborate' with stakeholders (Geekiyanage et al., 2021). Also, from a methodological perspective, mind-maps can help in summarising qualitative data, synthetising information using visuals, connections and relationships. This approach towards more visual interface for participatory processes and stakeholder engagement is also relevant in making comparisons among different results, or different focus groups (Daley, 2004), as well as contributing to moving from an abstract and thought-based approach towards a more practical and operational approach (Fearnley, 2022).

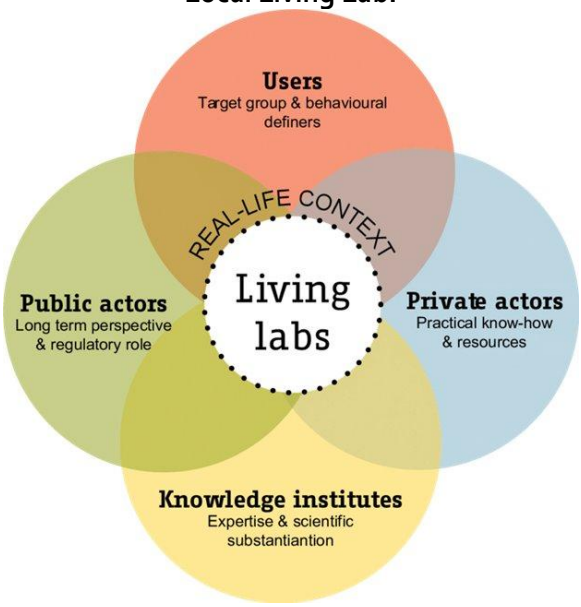
Considering the URBREATH project, more specifically, mind maps have been used during different co-creation sessions and one-to-one meetings. This tool highlights the importance of conducting an interview with a visual already displayed, which enables participants, in this case, the Frontrunner and the Follower Cities, to better understand the content, topic, and flow of information.

2.2.4 Local Living Labs (LLL)

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 7). 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, 2009). 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 7: 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[22] was a major source of practical

[22] Source: https://unalab.eu/system/files/2020-07/living-lab-handbook2020-07-09.pdf (Last Access: February 2025).

inspiration. Additionally, the ongoing work of Living Labs in the EU soil mission, specifically the NATI00NS project[23] and the European Network of Living Labs (ENOLL), has been important guidance.

2.2.5 'World Cafè' Research – Demo Cafè

The World Cafè (WC) is a tool that fosters co-creation and participation among different stakeholders. It was first introduced by Brown and Isaac in 1995, and was designed to be a participatory process that can facilitate the dialogues between citizens and other stakeholders, using an informal, yet organised, cafè setting, making communication more neutral, and enabling people to engage more actively in the different dialogues (Brown and Isaac, 2005; Löhr et al., 2020). This setting provides a valuable tool for collecting data, relying on collaborative actions and dialogues, while fostering the creation and brainstorming of new ideas (Stöckigt et al., 2013). This helps facilitate knowledge-sharing, enhances dialogues among different participants, and enables further comparison of results, while considering the heterogeneity of the participants. It also encourages mutual and reflective learning (which is also relevant from a project perspective, see **Section 2.1.3**).

Organising a World Cafè is also essential in ensuring effective qualitative results and inputs from a variety of actors, as well as taking advantage of speeding up the research (as it is frequently organised as a one-day workshop, see Schiele et al., 2022). In doing so, Brown and Isaac (2005) defined seven important design principles to better organise these experiences: (1) set the context; (2) create hospitable space; (3) explore questions that matter; (4) encourage everyone's contribution; (5) cross-pollinate and connect diverse perspectives; (6) listen together for patterns, insights, and deeper questions; and (7) harvest and share collective discoveries. Furthermore, as highlighted by Monforte et al. (2023) - recalling Brown and Isaac – the process for organising the World Cafè includes five key elements:

- The environment needs to be informal, similar to a cafè. This would help and facilitate the dialogue and the exchange of information and feedback.
- A warm welcome and an overview from the host. This will clarify the objective of the event, enabling the discussion and knowledge-sharing and production among different stakeholders, whon can also benefit from the interaction and the exchanges (Aldred, 2011).
- Three or more 20 min rounds of conversation between small groups of four or five participants, which supports the kind of informal dialogue and the incremental co-creation of knowledge.
- A key question underpins each round, which may build upon one another in subsequent rounds. This would enable certain kind of flow of information, especially from the research question and the data collection perspective. This also helps hosts and participants to get a better overview of the outputs and objectives of the session.

[23] 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).

- A final round to share the results of conversations with the wider group, which contributes to enhance the general understanding, and supports peer-to-peer learning and the knowledge co-creation process.

From an organisational and a methodological perspective, the URBREATH Demo Cafès have been structured considering the main elements and the founding principles. They have been used specifically by technical partners (mainly WP3 and WP4 partners) to demonstrate the URBREATH functionalities to the pilots, and to the other members of the consortium. This enhances the discussion both from a city-oriented perspective, and from a technical and non-technical partners perspective.

2.2.6 Adaptive Pathways and Scenario Definition

Scenario definition and scenario-building are essential for setting robust pathways, especially considering uncertainty and the potential risks associated with 'nature' and climate change. Scenario definition is essential for considering short- and long-term impacts and developments; in climate adaptation, change unfolds as a process rather than a single event, action, or goal (Agrawal and Carmen Lemos, 2015). In the urban planning domain, the use of scenario definition tools and approaches has been frequently employed to implement decision-making frameworks (Hopkins and Zapata, 2007; Chakraborty and McMillan, 2015) and stakeholder engagement (Healey, 1997; Forester, 1982). In this context of assessing uncertainty and designing potential scenarios for nature restoration and climate adaptation policies, one of the main tools that emerges as a potential solution is the adaptation decision-making approach (see Haasnoot et al., 2024). Similarly to scenario definition, this approach – called Decision Making under Deep Uncertainties (DMDU, see Marchau et al., 2019; Bonjean Stanton and Roelich, 2021; Haasnoot et al, 2024) uses Dynamic Adaptive Policy Pathways (DAPP) (Haasnoot et al., 2019), which describes trajectories over time, and is considered as a flexible, decision-focused tool for addressing foreseeable actions (Werners et al., 2021), that can respond to new inputs, when a new condition or new information in the set environment is detected (Buurman and Babovic, 2016): this creates path-dependency and limits the options of solutions and actions to be considered for securing and support robust long-term decision-making (Muccione et al., 2024).

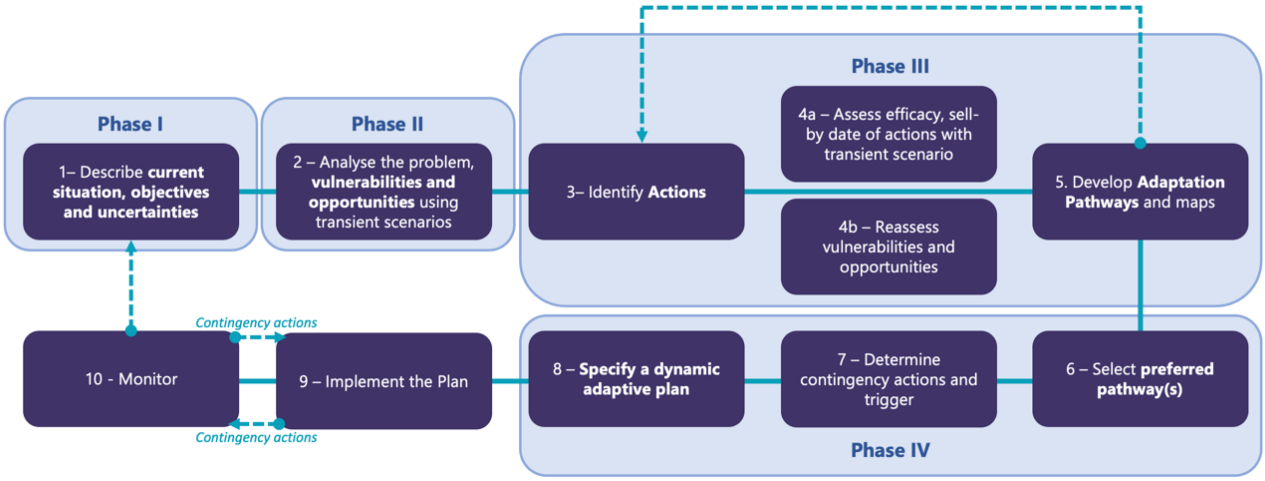
DAPP was reviewed as a possibility to implement in URBREATH, since it equips users with tools to evaluate options, identify adaptations, and develop implementation plans for climate-related challenges (Marchau et al., 2019). The methodology incorporates policies as a way to help decision-makers keeping options open, avoiding possible blocks, by planning contingency actions which provide flexibility to decisions without compromising robustness. Policies are also able to be constantly revised by including monitoring, learning and governance, which helps the adaptive process (Haasnoot et al. 2013).

Given the capacity and workload of the cities, a "light" version of the DAPP was implemented, based on a qualitative, stakeholder-input approach (Carstens et al. 2019; Warren et al. 2021). Rather than the full 10-step DAPP method shown in Figure 8, the adapted four-phased approach focusses on:

1. Describing the city objectives (ref. Step 1),
2. Risk assessment (ref. Step 2),
3. Action identification and assessment (Step 3, Step 4, and Step 5), and
4. Developing adaptive pathways (AP) and finding robust strategies (ref. Step 6, Step 7 and Step 8).

This modified version, preserves the core DAPP principles, while allowing cities to deliver actionable outcomes within their time and resource constraints.

Figure 8: Dynamic Adaptive Policy Pathway (DAPP) approach methodology and its adapted version for URBREATH purposes.



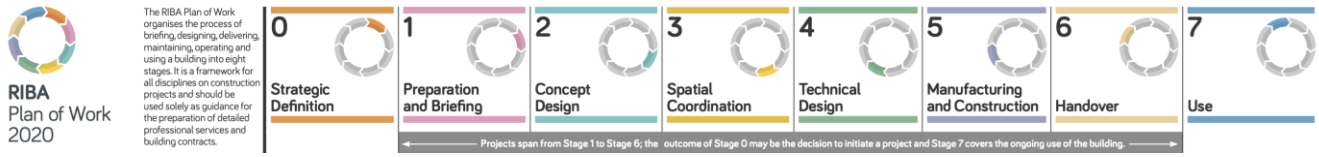
Source: Haasnoot et al. 2013. Ri-elaboration by the authors.

Following this approach, the URBREATH project defines possible pathways for the NBS implementation considering different risks and potential solutions and actions to be taken. Each city, both Frontrunner and Follower Cities, work in the definition of objectives, risks and actions using the Adaptive Pathway approach to better integrate long-term actions supporting higher co-benefits and impacts (see **Subsection 2.3.3**).

2.2.7 RIBA Plans of Works

The RIBA (Royal Institute of British Architects)[24] Plan of Work is a structured framework that sets out the entire lifecycle of a building or spatial project, from the first idea to long-term use. It breaks the process into defined stages along the bigger milestones of the project (such as applying for planning permission, tendering or completion of construction). Each stage is outlined with core tasks and outputs, providing a clear roadmap for design, coordination, and monitoring (Figure 9).

Figure 9: The RIBA Plan of Works and its steps.



Source: RIBA Plan of Work 2020 Overview (available here: https://www.riba.org/media/syneeeto/2020ribaplanofworkoverviewpdf.pdf).

The Plan of Works identifies nine different 'Project Strategies' that relate to different key aspects of the project and its implementation.
The *Cost Strategy* establishes a structured framework for financial control, encompassing cost planning, estimation, and continuous monitoring to ensure budgetary compliance. The *Planning Strategy* addresses statutory requirements and integrates regulatory considerations within the design process to secure on-time approvals and minimise delays. The *Procurement Strategy* defines the contractual and delivery framework, determining risk allocation and supply chain engagement to optimise efficiency. The *Risk Strategy* focuses on identifying, assessing, and mitigating technical, financial, and legal risks through proactive management. The *Plan for Use Strategy* prioritises operational performance, supporting a smooth transition from construction to use, and promoting long-term building efficiency. The *Inclusive Design Strategy* ensures accessibility and usability for all users by embedding principles of equity and diversity throughout the design process. The *Sustainability Strategy* promotes environmental responsibility by integrating energy efficiency and sustainable practices throughout the project lifecycle. The *Health and Safety Strategy* ensures compliance with safety standards to protect all stakeholders during design and construction. Finally, the *Fire Safety Strategy* addresses fire prevention and protection measures.

In URBREATH, the RIBA Plan of Works has been adjusted based on the EU framework, and the landscape architecture, especially focusing on NBS. In particular, the major adjustments are: (i) the number of stages that have been reduced to five - brief setting, concept design, preliminary design, detailed design, construction, handover and monitoring; (ii) the Project Strategies have been reduced to four –

[24] Available here: https://www.riba.org/media/syneeeto/2020ribaplanofworkoverviewpdf.pdf (Last Access: July 2025)

cost strategy, planning strategy, inclusive design strategy, and plan of use strategy – which are more related to the development and implementation of NBS in public space[25].

2.2.8. Citizen Science

Citizen science is a participatory approach enabling citizens to actively participate in decision-making and in urban planning matters. This approach, as expressed by Vohland et al. (2021, p. 1), considers the active engagement of the general public in scientific research tasks', which means that it is a process through which data are collected and knowledge is produced as a collaborative process between citizens and researchers (in this regard, see Yu et al., 2025) . More in general, frequently associated with participatory processes and co-creation practices (Mačiulien and Mačiulis, 2017.), citizen science can help researchers in (i) gathering localised information for specific contexts, and in (ii) collecting data with low-budget systems (Beck and Mitkiewicz, 2025). Aligning with the bottom-up perspective of decision-making processes, citizen science can be a valuable approach enabling certain local issues to be at the forefront of urban agendas: it, indeed, provides a different lens with which citizens' needs can be mapped and investigated (Liu et al., 2023). Furthermore, as smart cities, sustainable development and data-driven analyses and decision-making are progressively growing its importance, citizen science is considered a potential tool for both increasing the level of civic participation and producing and collecting data (Beck and Mitkiewicz, 2025). Generally, citizen science does not have a specific tool or method, but rather it relies on a suite of different approaches that emphasise and support citizens' engagement (e.g. community-based data collection). On this note, it is essential to consider citizen science as a tool for data observation and measurement, which can enhance the understanding of specific urban needs. However, the role of citizen science does not have to be considered as the main resource for data collection and analysis, as some of the data can be misread or misinterpreted, considering the real nature of the inputs (see Devisch and Veestraeten, 2013; Pocock et al. 2019).

In URBREATH, citizen science has been used as a tool to enhance the co-creation and participation of citizens within the Local Living Labs activities. It also serves as a way to collect information and input to define and set up certain specific KPIs (Key Performance Indicators), related to 'quality measurements'. At the same time, citizen science can be a valuable tool for the project to understand and assess the pilots' needs, taking into account the socio-economic environment. It could serve as a monitoring tool for measuring the impact of the NBS implementation in Frontrunner Cities, and a decision-making approach for Follower Cities and their Development Planning for the NBS in the pilot site.

[25] In this regard, the 'Procurement Strategy' will be discussed – with different terms – within Deliverable D6.7 - Procurement and city preparation for NBS intervention - V1 (submitted in M24); while the other are not strictly taking into consideration public spaces, dealing and referring more to building efficiency, safety and institutional risks (e.g. Risk Strategy, Sustainability Strategy, Health and Safety Strategy, Fire Safety Strategy).

2.3 Application of the methodological framework

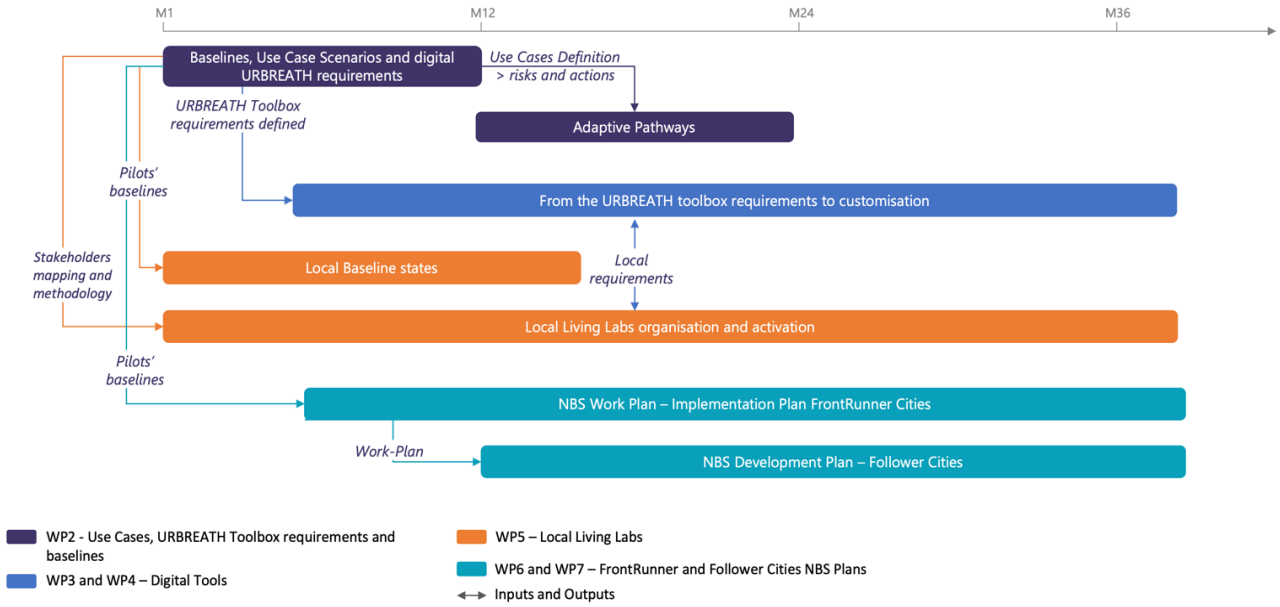
This section briefly described the highlights of the project, highlighting the methodology application. In particular, it presents the work being done within the first two years of the project (M1, January 2024 – M24, December 2025). Rougly, it is possible to distinguish among six workstreams, some of them working in parallel whilst some others working as the baseline for further implementation and development. From a chronological perspective, the workstreams are clustered as follows:

- **Setting the basis: cities' baselines, use case scenarios and bridging the gap between general and local digital requirements (Section 2.3.1).** This section presents the work that is extensively displayed in different Deliverables (ref. To Deliverable D2.4 - Use case Scenarios and baselines; D2.5 - URBREATH Platform Requirements, submitted in December 2024; and Deliverable D5.1 - Local baselines state and URBREATH revisited requirements and technical framework – V1, submitted in June 2025). In particular, the focus of this section is to set the basis for different domains, especially those for the URBREATH Toolbox definition and implementation (WP3 and WP4); the use case scenarios and the cities baselines enabling the progressive implementation of the NBS in the Frontrunner Cities, and its planning in the Follower Cities (ref. WP6 and WP7); and the definition and development of co-creation models and Living Labs (ref. WP5).
- **Local Living Lab organisation and activation (Section 2.3.2).** This section describes all the activities that follow-up the work for better understanding the local baselines, and the relevant stakeholders to be included in the Local Living Lab, enabling co-creation and participation among different relevant actors (this work has been extensively presented in Deliverable D5.5 - Local Living Labs report – V1, submitted in June 2025). In particular, the section pointed out how the quadruple helix model is applied into local contexts, and how the pilots can enhance participation and cross-departmental collaboration to design and develop NBS in the chosen pilot site (ref. WP5).
- **Adaptive Pathways: from scenarios and their potential risks to actions and solutions towards Cities' Pathways (Section 2.3.3)**. This section depicts the different transformational pathways of each pilot city in facing risks and climate challenges. Overall, the section focuses on how all cities, starting from their defined scenarios, foresee their adaptive pathways in the short, medium and long term. Along with the associated risks and challenges, highlighted by each city, this section focuses on which kind of pathway could generate more impact and benefits, identifying actions and solutions to be considered.
- **From the URBREATH toolbox requirements to the contextual and local URBREATH toolbox (Section 2.3.4).** This section describes all the work that has been performed by the technical partners (in particular, WP3 and WP4) in identifying local requirements defined by the cities, to be further developed for the local digital platforms. Considering the analysis performed together with WP2 and WP5, technical partners are starting to deep dive into the different functionalities depicted and required by the pilots. The section explains the activities held by the technical partners and their relationship with the pilots.

- **NBS Deployment: Implementation Plan for FRCs and Development Plan for FLCs (Section 2.3.5).** This section focuses on the actual implementation of the NBS in the Frontrunners' pilot sites, considering the RIBA Plan of Works and its main phases. In parallel, it describes the joint activities done with the Follower Cities in designing their Development Plan with actions and activities to better plan NBS in their pilot sites, taking into consideration all the information, suggestions and hints from the work and experiences in Frontrunner Cities.
- **Public Procurement for NBS implementation in FRCs** (Section 2.3.6). This section describes the joint work among Politecnico di Milano, South Pole and Taltech in designing a procurement model (better described in Deliverable D6.7 - Procurement and city preparation for NBS intervention - V1, submitted in M24) for Frontrunner Cities, enabling the progressive standardisation and operationalisation of NBS public procurement. In doing so, the model highlights key elements that need to be taken into consideration while dealing with NBS. Similarly to the previous activity, Follower Cities focuses on the potentialities of including specific elements in their public procurement processes to better assess NBS quality and development.

Overall, these activities have applied the methodology in different ways, always considering the four principles. Furthermore, in each clustered activity that will be better explained in the dedicated sections, there will be a reference to the specific method or tool used to perform the specific outcome. Figure 10 shows synergies and inputs among the seven 'workstreams' and identifies the timelines.

Figure 10: Timeline of the seven different workstreams and their topics, with specific focus on input and information that enable continuous and progressive exchange among different activities, and WPs.



Credits: Elaboration by the authors.

2.3.1 Setting the basis: cities' baselines, use case scenarios and bridging the gaps

The first activity of the project entails the definition of the baseline of the pilot sites, and the preliminary analysis and setting of the toolbox requirements to be deployed in the general URBREATH Toolbox. Combined with this initial scoping, these activities delve into the contextual and the more detailed definition of the pilot sites, filling the gaps, and better understanding the contextual conditions of the cities. This work has been jointly performed by partners from WP2 and WP5, together with Frontrunner and Follower Cities, and also engaged technical partners for the initial definition of the toolbox requirements (Task 2.5 Leader and contributors). Overall, the main instruments and tools used for these investigations are based on collective workshops, co-creation sessions, one-to-one meetings, and, as a supporting tool, service blueprints (especially employed in WP2 activities) and mind maps (used during the one-to-one meetings by WP5).

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

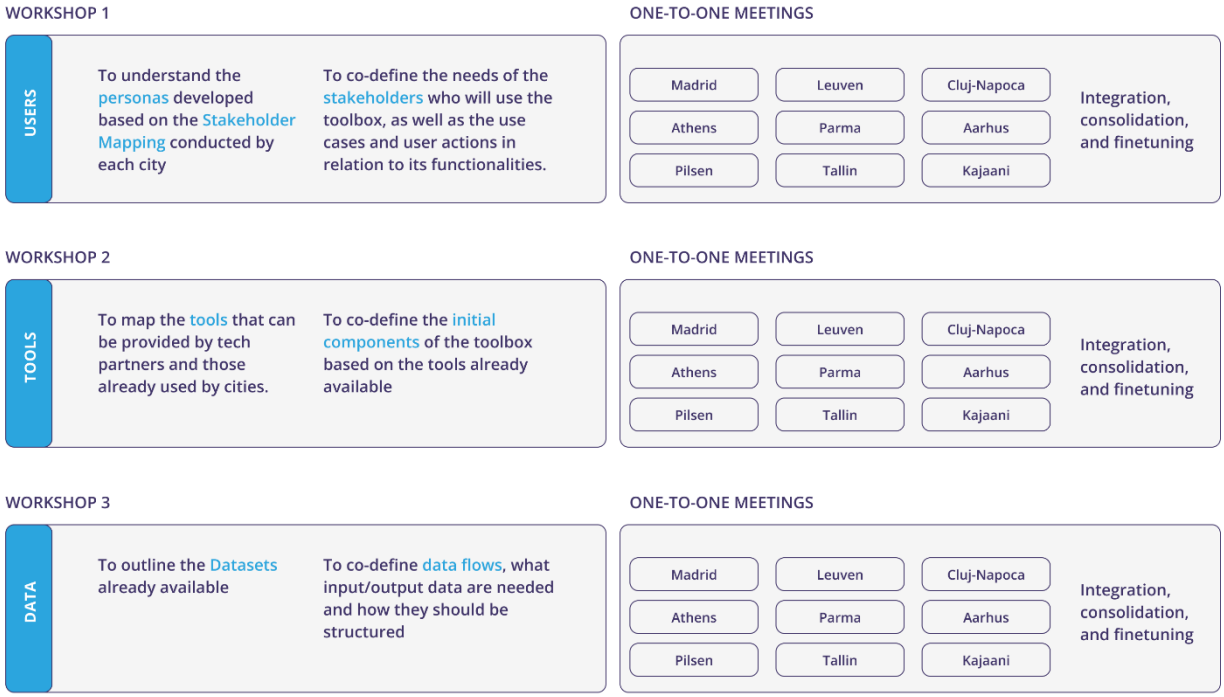
After the initial city-to-city exchanges, which focus on sharing general information, cities engage in a more structured activity to deepen their stakeholder analysis. The goal is to leverage their knowledge to compare their respective situations and identify commonalities within and across climatic 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 11: 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 by the authors.

First Composition of Local Living Labs

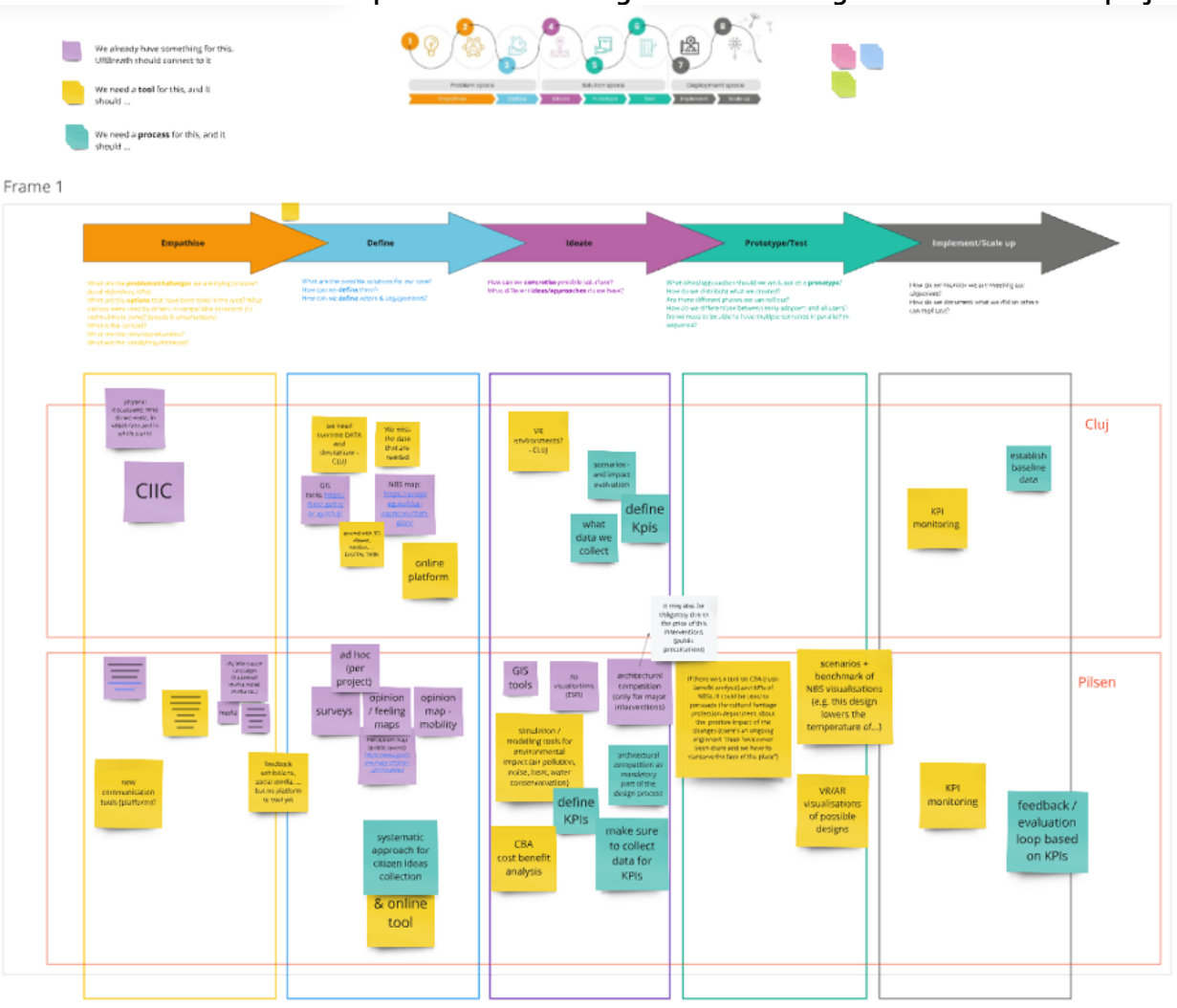
These initial rounds of meetings were conducted in parallel with the stakeholder mapping activities. The first step of the mapping activity (i.e., defining interested stakeholders, their opportunities, and challenges) also serves as a strong basis for investigating the organisation and design of the 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-to-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 2.3.2**) 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 12: 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.



Credits: Elaboration from WP5.

User Journey Mapping and Touchpoints

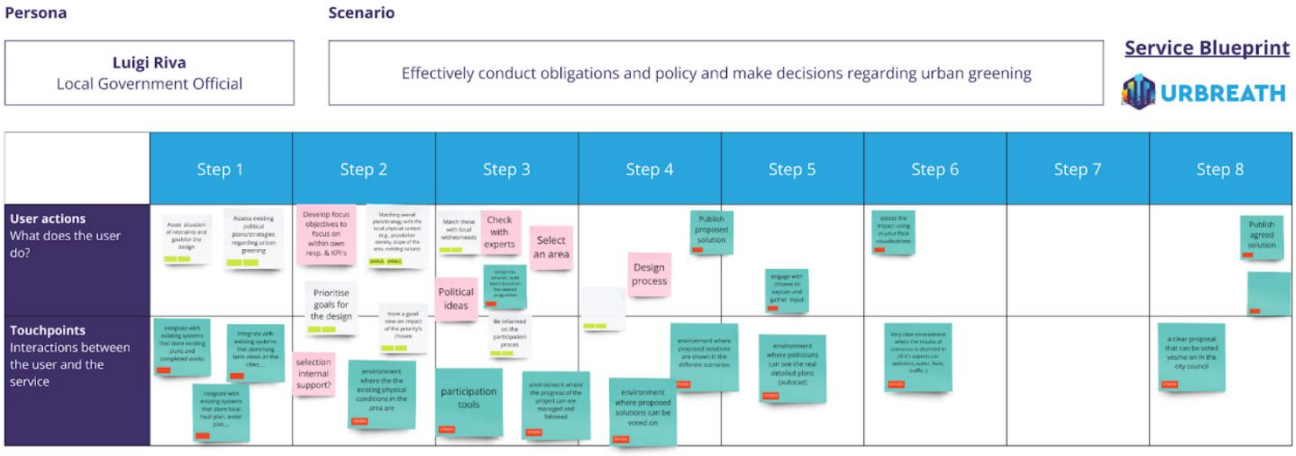
This session aims to further develop the design of the URBREATH Toolbox by defining potential use cases based on the personas identified in the previous step. The workshop is structured around the detailed description of these personas and their key characteristics, guiding cities in exploring specific 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 13: Service Blueprint Canvas used for designing the user journey. The personas have 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.



Source: Miro Board, URBREATH. Atlantic Zone.

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[26] behind each defined use case scenario, allowing for the customisation of users based on the specific requirements of each city. Unlike the workshops, 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[27] 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

[26] 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'."

[27] 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.

work done in the first workshop about 'users', the 'tools' session focuses on the third line of the service blueprint: 'functionalities'.

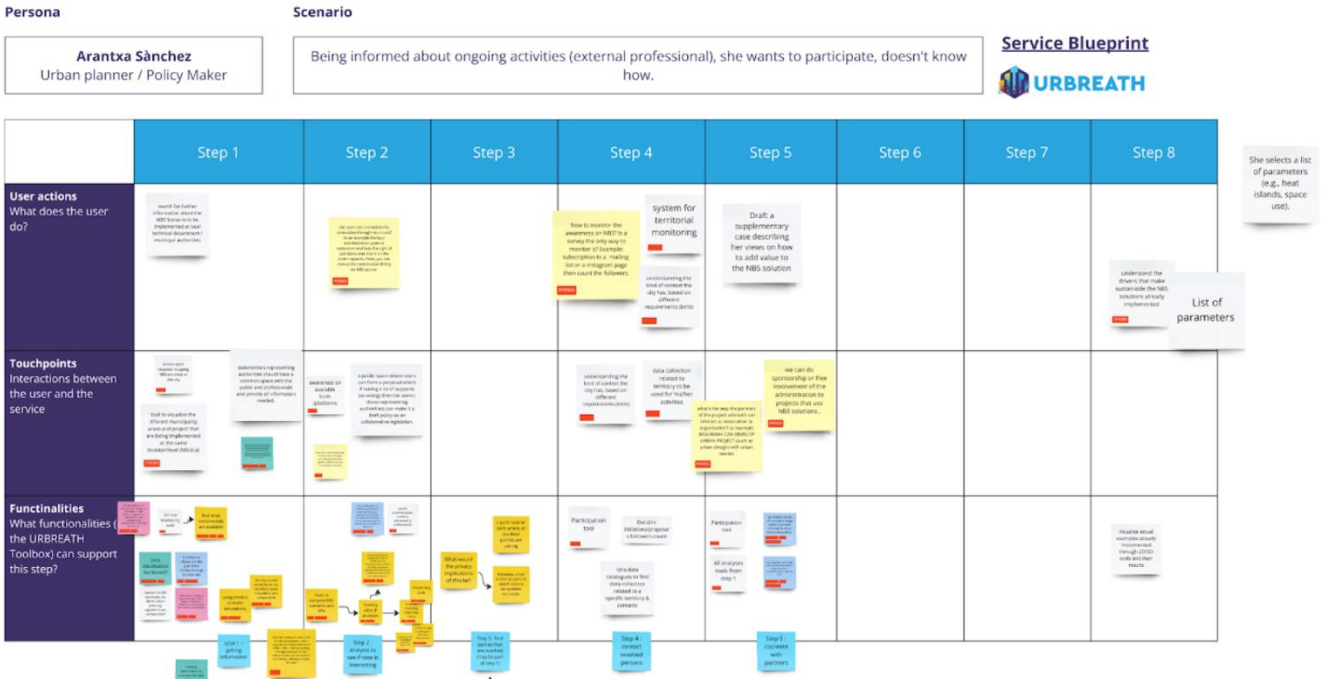
Objective: To map the tools that can be offered by tech partners and those already used by cities, and to collaboratively define the functionalities of the URBREATH toolbox. In the interactive session, participants—grouped by climatic areas—are tasked with matching touchpoints in the user journey maps (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:

- **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 14: Service Blueprint used for designing the tools functionalities to interface with the user. Cities are asked to think about which functionality could help the user journey they have already discussed in the previous workshop.



Source: Miro Board, URBREATH. Mediterranean Zone.

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 Living Labs definitions

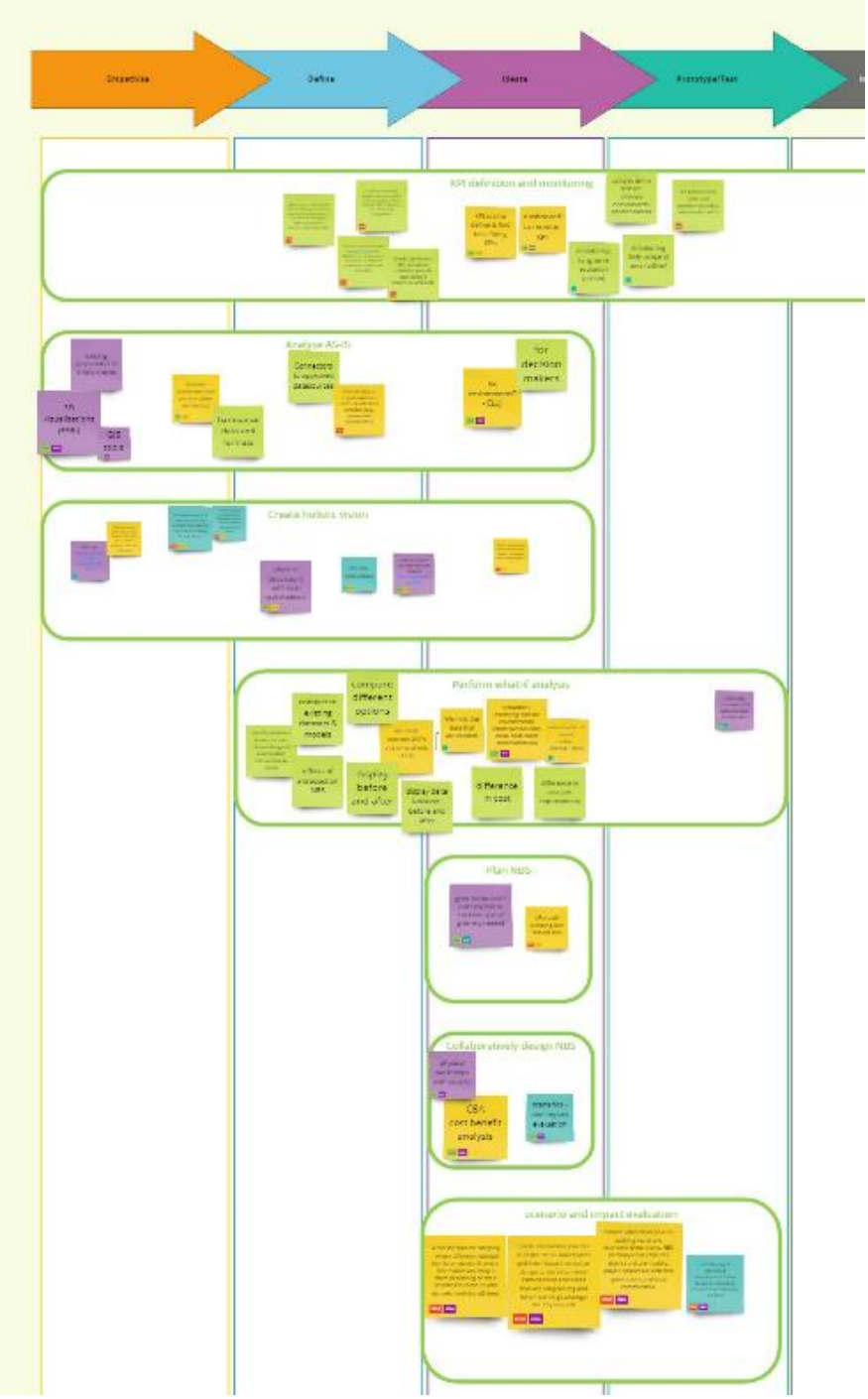
Two workshops are organised, building further on the outcome of the first series of the Local Living Lab Composition. The two workshops are organised combining two different Climatic Zones in the same slot. This set of workshops had a dual focus on requirement-mapping and Local Living Lab status monitoring.

Objective: This exercise 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 mind-maps (see **Section 2.2.3**), 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 mind-map 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 mind maps, a list with 66 requirements was established and presented to the pilots.

Figure 15: Deep dive MIRO board exercise detailing out the availability and needs of tools, processes and functionalities for pilots' use cases.



Source: Miro Board organised by WP5.

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.

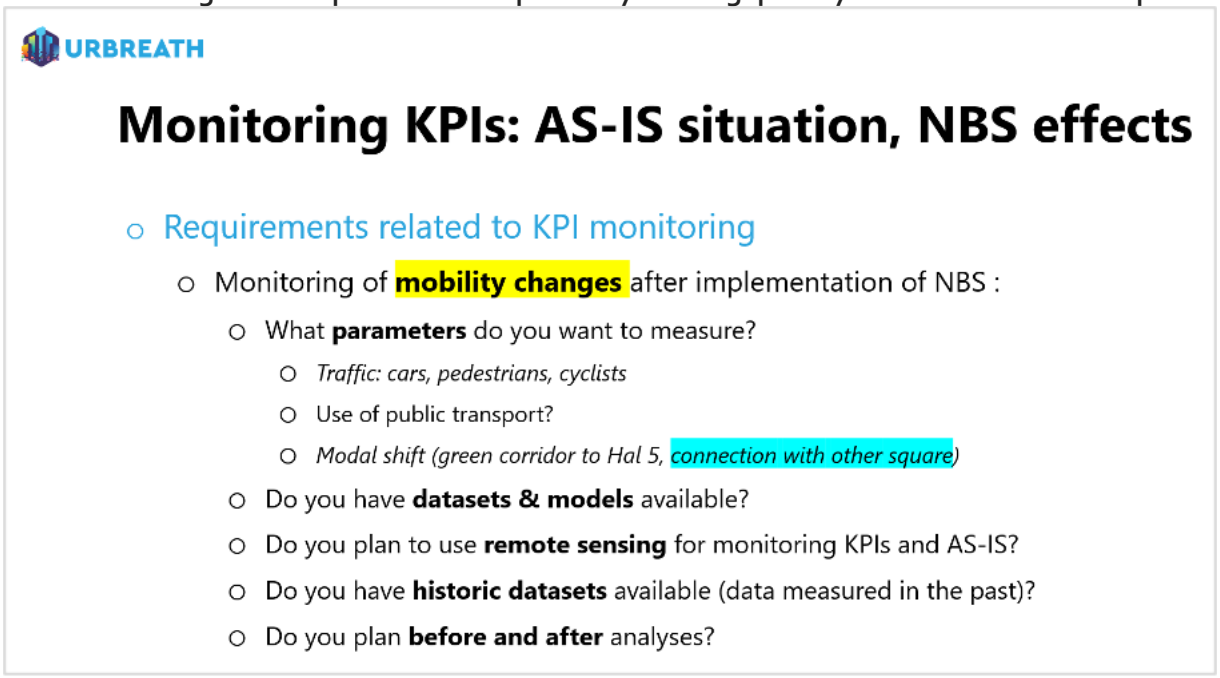
Objective: To highlight the correlation between the use case scenarios and their interpretation based on the list of requirements drafted by technical partners. This allows cities to be more specific about the processes and data they would like to use. Assessing scenarios and their related requirements 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 16: 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

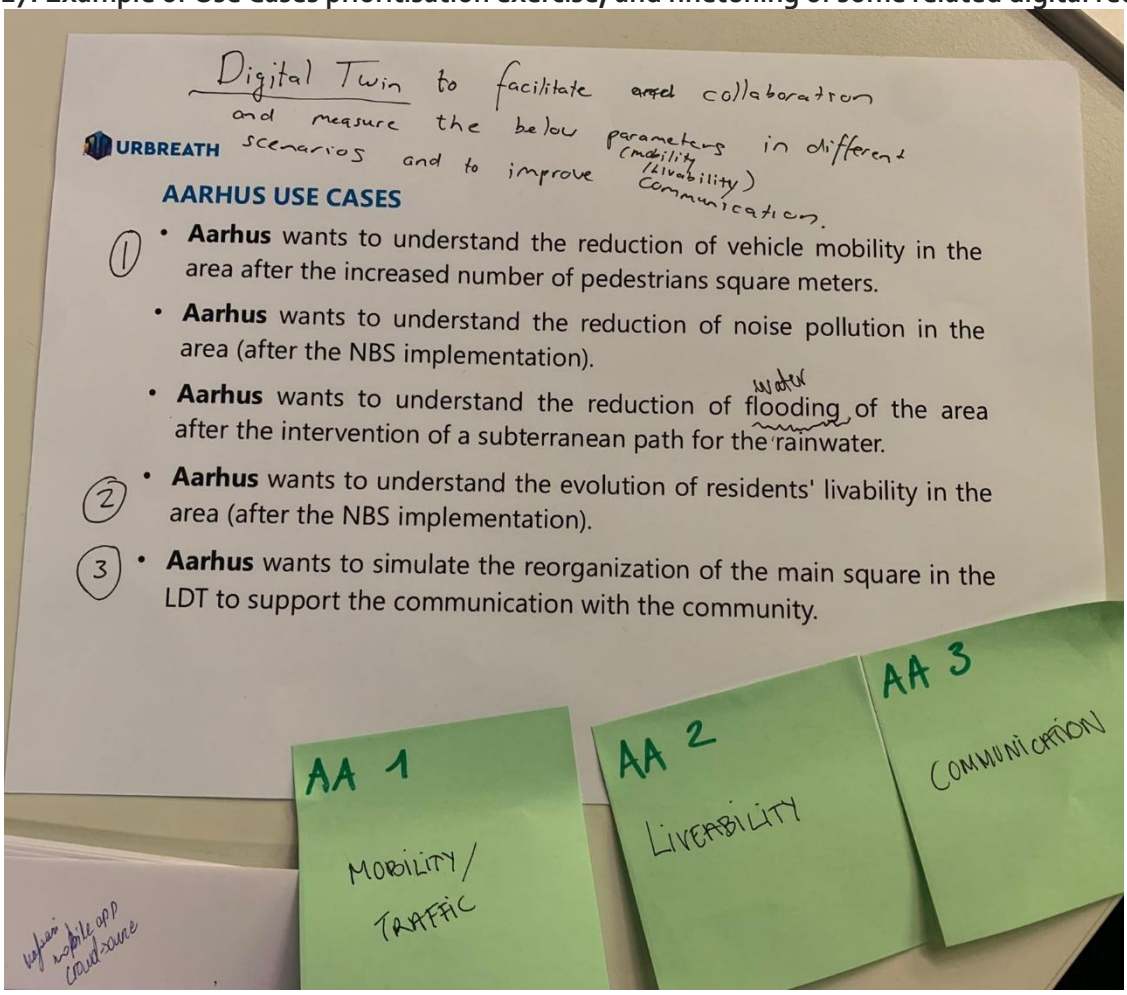
- **Train the Trainer.** In this session, the scenarios and the related epics are presented to the technical team of the consortium (WP3 and WP4). This training session is essential to ground the 'wishlist' that cities have discussed according to their needs and expectations of their scenarios from a 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 '**Assessment: 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 one-to-one meetings (Figure 17). 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 17: 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

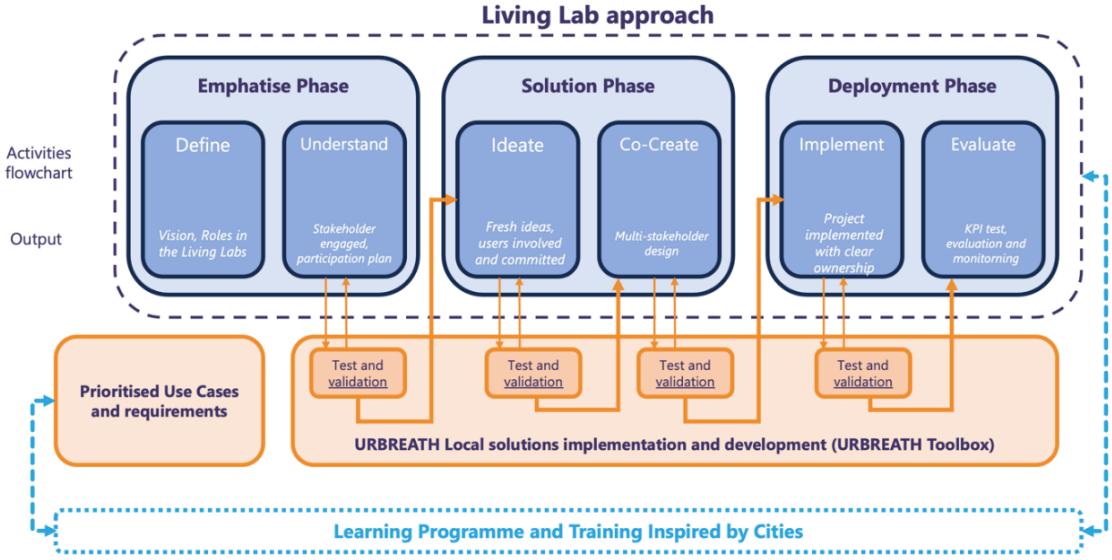
and NBS implementation to give cities a general overview of the proposed digital functionalities supporting them in the implementation of the NBS.

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.

2.3.2 Local Living Labs organisation and activation

Based on the scientific review, earlier EU projects, and the activities planned within the URBREATH project, we propose the following Living Lab framework (Figure 18). 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 18: Organisation of the different steps structuring the methodology of the Living Lab approach, and its relationships with the digital tools and the means of validation.



Credits: Elaboration by 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[28]. The second layer shows the development and interaction of tools 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 18). 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

[28] 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.
- 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, liveability, 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).

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 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

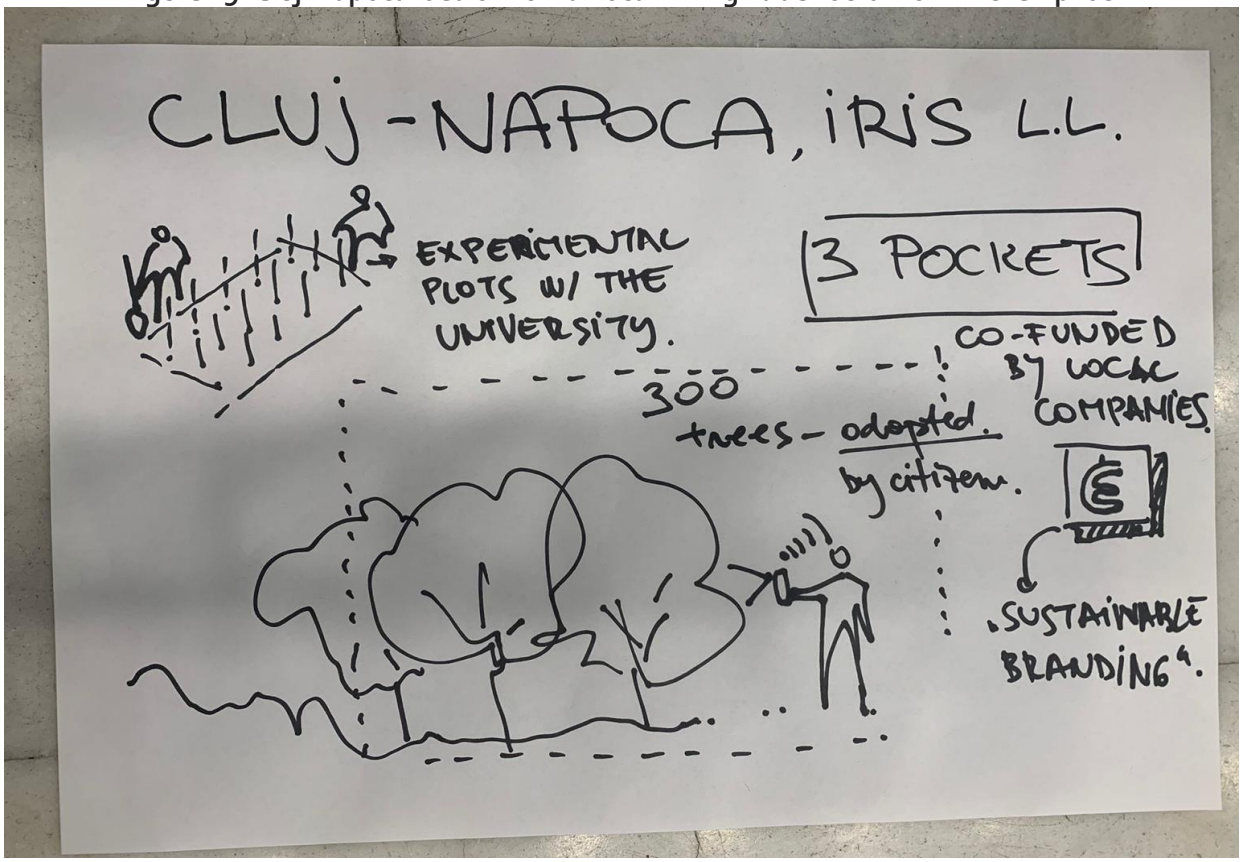
The initial approach to structuring the Living Lab involves four roundtables with cities, divided by climatic zones. This setup allows cities to start considering what they would like to do and experiment with in the context of the Living Lab, with a specific focus on the pilot area. The discussion was 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 19: 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 **Annexe I**). 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).

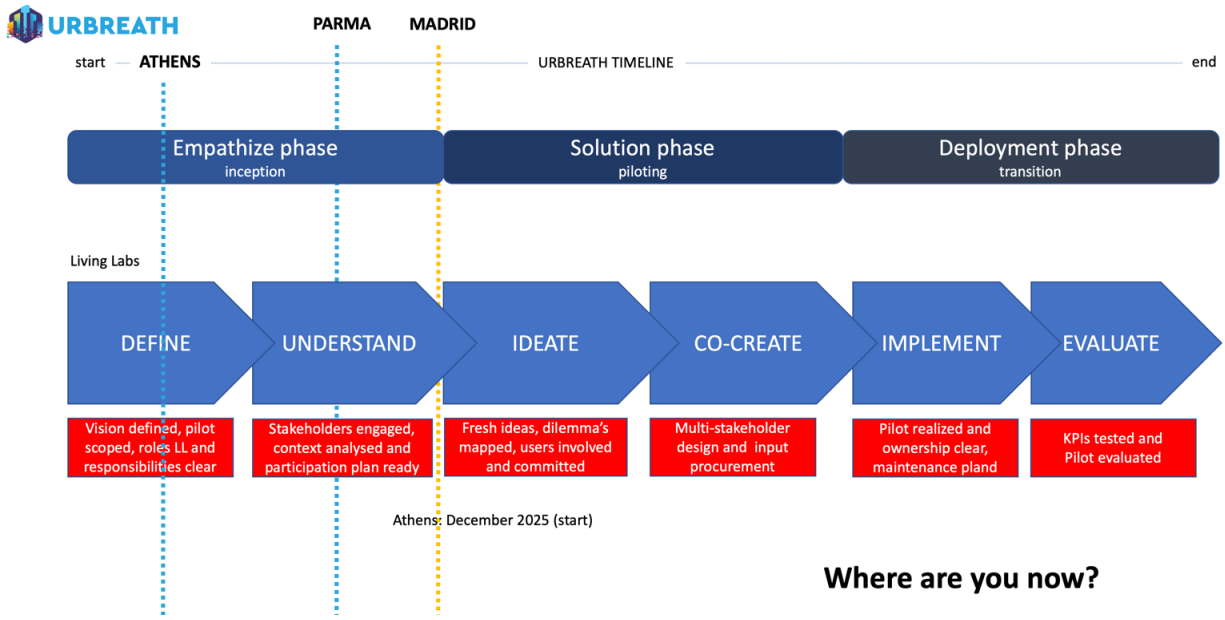
These workshops have been running in parallel with the Workshop on preliminary technical solutions, providing cities with a general overview of the links between the digital platform in each city, the implementation of the NBS, and the experimentation of decision-making and co-creation processes. In 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 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 20: 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.

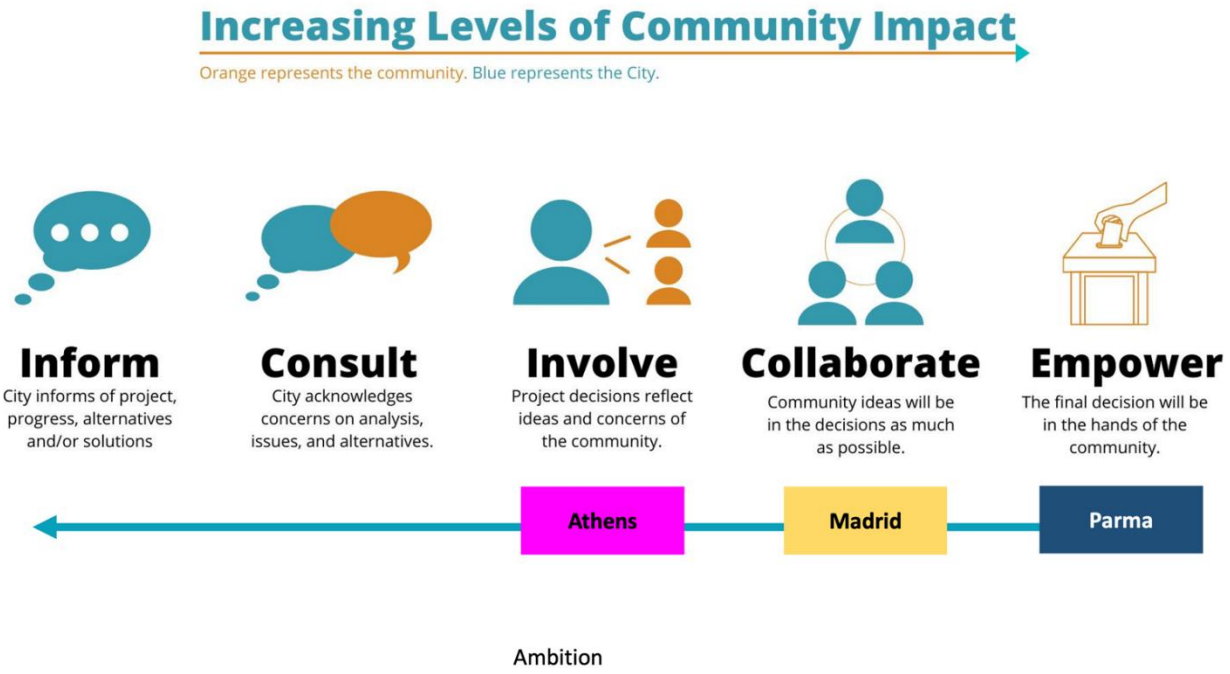
Objective: The goal is to define which stakeholders should be involved in the Local Living Lab for each city. Cities must engage these stakeholders in discussions by presenting the project in the pilot area, aligning on priorities and scenarios, and clarifying roles and commitments.

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 21: 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 (based on: 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[29]).

[29] 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.

Ongoing activities with the LL

This process of collecting information, as part of the work delivered by WP5, is a continuous report of all the activities that are performed in the pilot sites by all cities (both Frontrunner and Follower ones). It delves into the co-creation and participation processes that the public administrations of each pilot site are doing with the citizens, and the other relevant stakeholders, to raise awareness on the development of the pilot site, as well as co-create the design and the steps for the implementation.

Objective: To report all the activities and tools that are used during the *in loco* session of co-creation, in order to get an extensive report of the process of co-creating the pilot site. It includes challenges and opportunities that public administration is facing in achieving their goal for implementing NBS in the pilot, and it serves as a peer-to-peer learning for all the pilots as most of the results have been reported during the City Calls. This activity also helps WP5 to understand whether cities need support on specific steps and processes, and it helps to define and organise further steps in achieving their 'ambitions'. As this process is still ongoing and will last for the entire period of the project, dedicated deliverables in WP5 (e.g. D5.1 - Local baselines state and URBREATH revisited requirements and technical framework - V1, and D5.5 - Local Living Labs report - V1, both submitted in June 2025) will better describe the specificities of each city with their activities and outcomes.

Tools and Process: The tools and the methods that are used are different considering the different levels of maturity of the Cities. There are cases in which co-creation and citizens participation is a kind of ordinary practice, so the tools are frequently focussed on in-person and face-to-face working groups and co-creative sessions (using maps, SWOT analysis and the like, e.g. in the case of Leuven), and other that are more supporting the *in-place* activities enhancing communication and the valorisation of civic activism (e.g. in the case of Tallinn, where people are directly involved into making the pilot site more accessible and more pleasant for the community). Furthermore, communication and campaigns are used to stress the importance of the intervention in the area, and is used to convey more general ideas on sustainable development and resilient planning.
Generally speaking, the methods that are used rely on civic participation toolkit and they serve as the basis to better understand people's needs and opportunities.

Outcomes: A progressive and ongoing 'Participatory Process' which highlights how the Cities are tackling the process of implementation (Frontrunner Cities), and design and planning (Follower Cities) of the NBS in their pilot site. With this process, the community is more engaged and directly involved in the project and in the actual implementation of the NBS, contributing to raising the sense of belonging, trust and commoning practices.

Citizen science Training

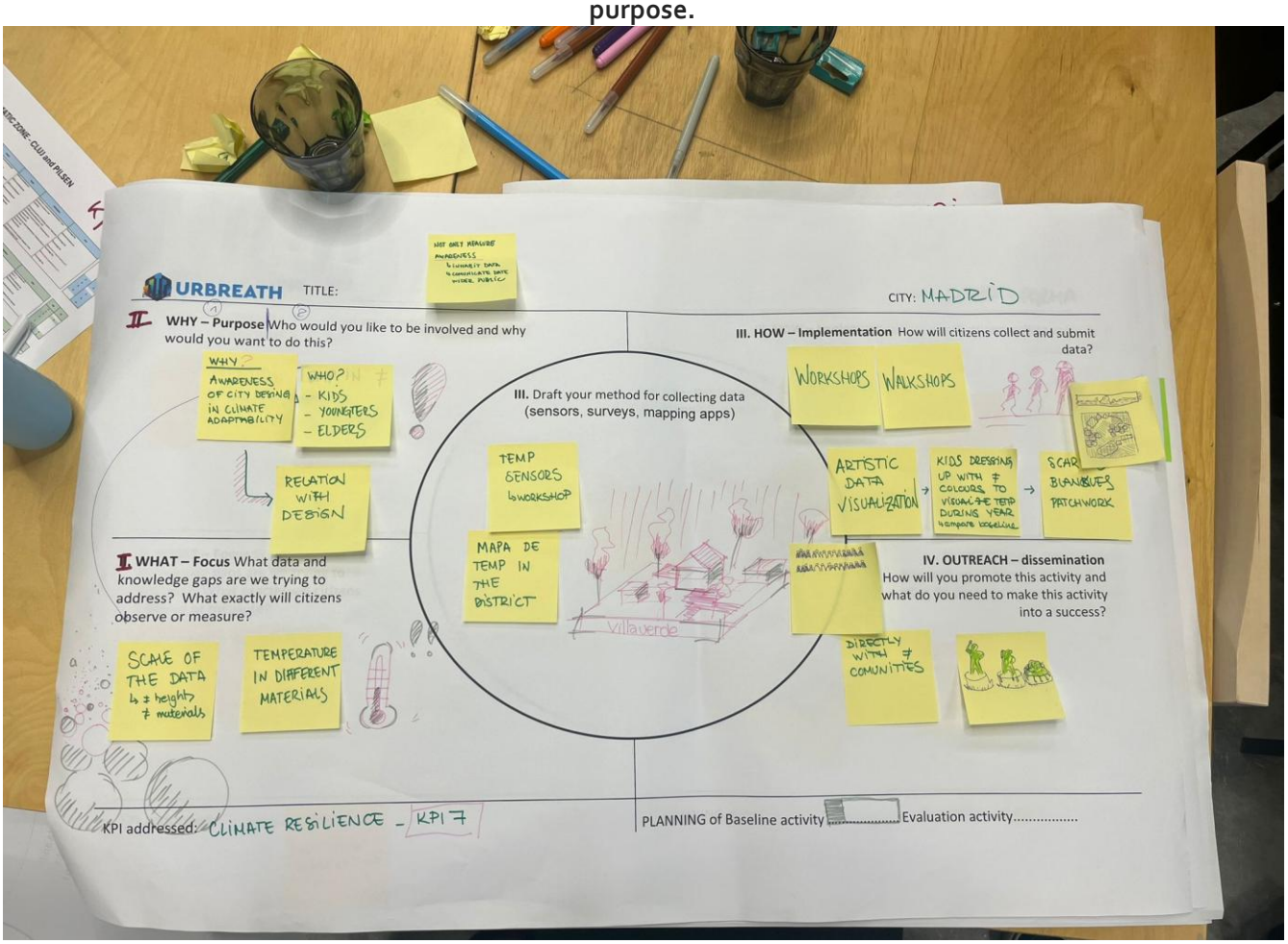
In the different phases of the Living Lab, stakeholder engagement remains crucial. Even when the solutions have been co-designed. Therefore, during the General Assembly in Tallinn (M22), a Train the Trainer session was held to develop the understanding of citizen science among the Frontrunner and Follower Cities. Citizen science helps the pilot's development and also could potentially fill data gaps that the Pilot has in evaluating their chosen KPI's. For this reason, each Pilot and Frontrunner based on potential data gaps co-created a citizen science activity akin to their needs.

Objective: To build the capacity of city representatives and to design a citizen science activity able to fill potential data gaps in the chosen KPI's.

Tools and Process: The session was organised with Frontrunner Cities and Follower Cities, each working in their specific Climatic Zone, and with a specific canvas (see Figure 22). Each city selected and worked on a specific KPI that could be implemented and drafted considering the citizen science approach, and was asked to consider how they would like to perform these activities in their own pilot site. Together with the in-person activity, WP5 discussed a presentation in which explains the main key elements for a citizen science approach to be valuable and effective.

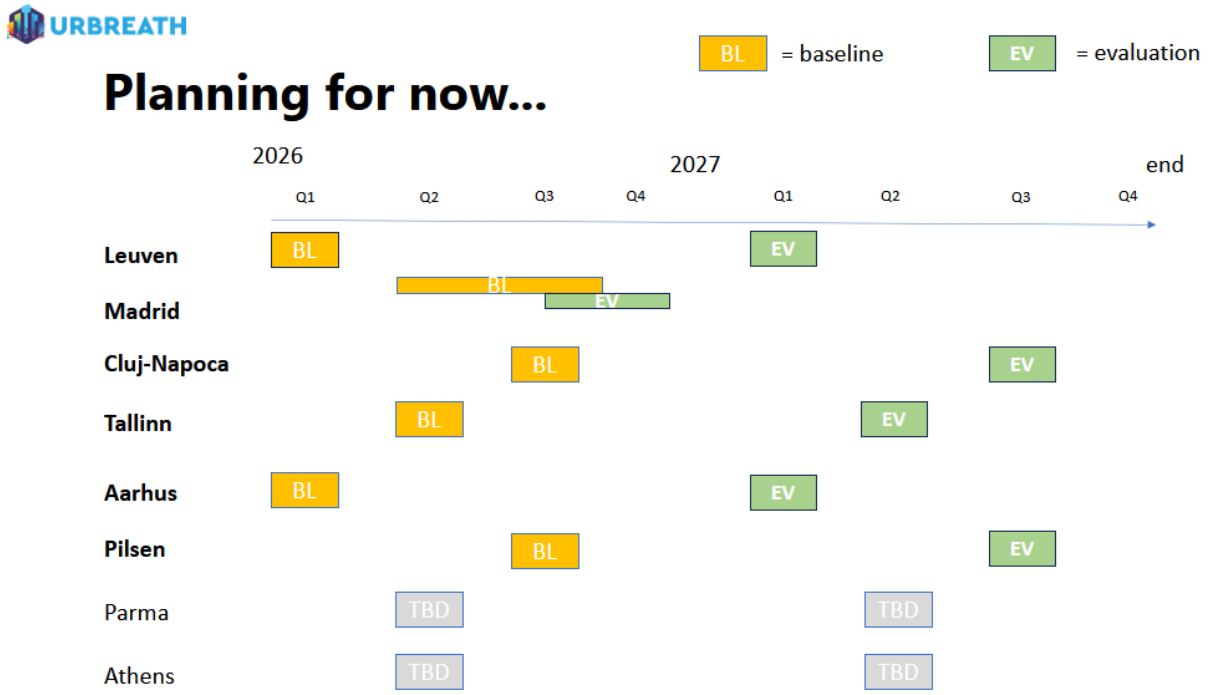
Outcomes: A made to measure citizen science activity for each Frontrunner and Follower City, including a preliminary timeline for the implementation of the activities as a follow up of the in-person workshop held in Tallinn (Figure 23).

Figure 22: Madrid canvas on how the city would like to perform citizen science activities and for which **purpose.**



Source: URBREATH, City of Madrid (Mediterranean Climatic Zone), General Assembly | Tallinn.

Figure 23: Assessment of each citizen science activity in Frontrunner and Follower Cities, according to the timeline of the project.



Source: Presentation by WP5 Leader.

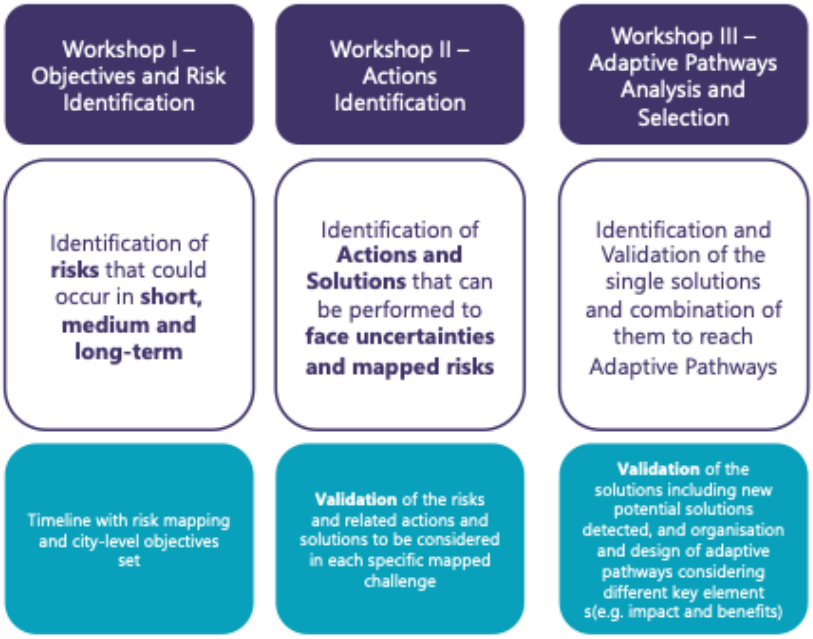
2.3.3 Adaptive Pathways: from scenarios and their potential risks to actions and solutions towards Cities pathways.

One of the main objectives of the URBREATH project is to consider NBS, its potentials and their benefits in the long run. Considering different timespan, it is essential to acknowledge that Frontrunner and Follower Cities are planning and implementing NBS in a complex environment, extremely uncertain. For this reason, each City has worked on the definition and design of specific and tailored Adaptive Pathway, considering their climatic challenges, their objectives and their related scenarios. In doing so, the combination of the Adaptive Pathway approach, and the co-creation sessions organised with online and in-person sessions helps cities in defining their goals, and to combine different solutions and actions to enhance decision-making processes, strengthen their vision, and create co-benefits in the long-term.

Following the DAPP approach presented in Section 2.2.6 three workshops (May 2025, September 2025, and October 2025) were conducted with all cities to gather the necessary input and create AP for their defined objectives. The first and last workshops were conducted in person during the General Assembly in Cluj-Napoca (M17) and the General Assembly in Tallinn (M22), while the second workshop was

conducted online. Figure 24 shows briefly the organisation of these activities, showing the description and expected outcomes for each workshop.

Figure 24: URBREATH Adaptive Pathways Workshop Structure.



Source: Elaboration by the authors

Preliminary workshop on risk mapping – Workshop I

The introduction of Adaptive Pathways and its structure was made considering different sources (see Section 2.2.6) and kind of activities that could help cities in understanding how to perform and to design adaptive pathways. Before considering activities with the cities, the Task Leader – Fraunhofer – designed a workplan and a timeline to assess adaptive pathways in all cities. In doing so, the first activity of investigation and assessment begins with the General Assembly in Cluj-Napoca (M17), where all cities were clustered in their Climatic Zone and were asked to map a preliminary identification of the risks in their city, that could arise and prevent NBS implementation, institutional changes and external *nuisances* (e.g. natural hazards). This first mapping was essential to organise the workshops to better define and integrate these risks, into robust and potential guidelines towards adaptation.

Objective: To understand which kind of risks are more likely to be happening in short, medium and long-term in each of the Cities, and more specifically in relation with the pilot site.

Tools and Process: The session was organised during the General Assembly in Cluj-Napoca (M17), and to each city there was a prepared canvas with a timeline (from short term, until 50 years), and cities were asked to write directly on the timeline which kind of risk they could face in different time span.

The work was organised dividing the cities in their specific Climatic Zone, so they can also have the possibility to understand and assess which kind of risks are more likely to happen in similar contexts.

Outcomes: First analysis of risks mapping as the basis for the creation of the adaptive pathways.

Figure 25: Risk Mapping exercise made during the General Assembly in Cluj-Napoca (M17). On the left, the City of Athens(a) presenting the idenfied risks; on the right the Atlantic Climatic Zone (Leuven and Aarhus) brainstorming on the risks (b).

Credits: URBREATH, City of Athens and Atlantic Climatic Zone (Leuven and Aarhus), General Assembly | Cluj-Napoca.

Follow-up on Workshop 1: Objective and Risk Identification

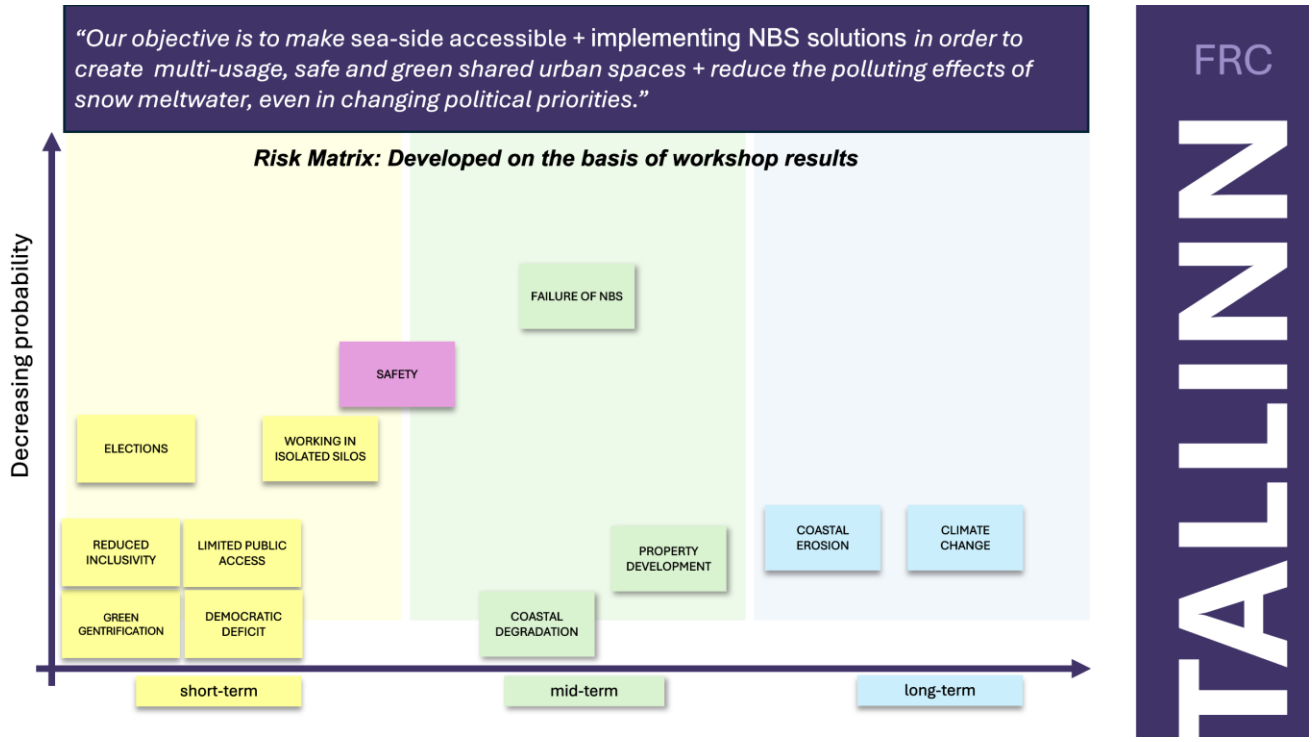
The main objective of the follow up was the identification of the objectives related to the NBS and risks that might affect them. This was done for each of the cities (Frontrunner and Follower), following the structure "*Our objective is to [main goal], to [specific benefit/outcome], even if [uncertainty/changing condition] occurs*". The identified risks were then catalogued by probability (low to high), and time (short-, medium-, or long-term), allowing cities to discuss possible bottlenecks in achieving their desired objectives. These risks were then compiled into a risk matrix as seen in Figure 24. This first workshop sets out the baseline for the work that was done in the subsequent workshops, since they built upon these results.

Objective: The main objective was to categorise all the risks considering the probability of each risk, and the timeline in which this risk could raise, considering the 'no-action taken'.

Tools and Process: A digitalised version of each timeline was sent to each City to gather information about their main objective. It also included the probability of the risk. The cities had to check the risks, add any relevant information that was missing from the previous workshop, and define which kind of probability these risks have. This activity was done offline.

Outcomes: First analysis and mapping of each risk identified by each Frontrunner and Follower City, based on the initial workshop in Cluj-Napoca. Validation of the matrix and of the general objective of each City.

Figure 26: Risk identification by cities: follow-up and digitalisation of the first canvas. The timeline is based on mapping short, medium, and long-term risks related to the objectives that the City wants to achieve.



Source: Tallin's risk matrix identification obtained from the first workshop. Elaboration by the authors.

Workshop 2: Actions Identification

The aim of the second workshop was the identification of possible actions that would help mitigate or overcome one or more of the identified risks defined in workshop 1. To achieve this, cities were divided into their four climatic zones to promote discussion and exchange through a Miro board, which had their previously identified risk colour-coded and ranked from high to low probability.

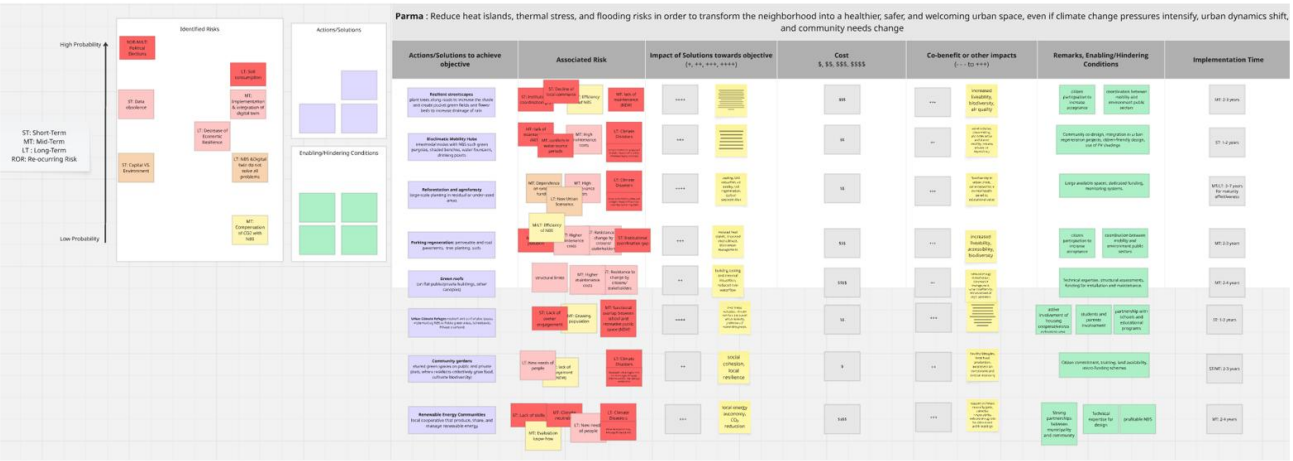
Objective: the aim of this second workshop was to relate each specific risk, or a cluster of them, with specific actions than can be performed to prevent or to cope with the mapped risk.

Tools and Process: For each of the identified risks the second workshop was prepared with a collaborative Miro board which identifies: actions, impact towards the objective, costs, and co-benefits had to be evaluated, according to each risk or the clustered risks. This was done by visually assigning a value that ranged from 1 to 4 for the impact and costs, with 1 being low impact/cost and 4 high

impact/cost and from -3 to 3 for the co-benefits. As an option, cities could also provide information about enabling or hindering conditions, and implementation time for the actions. Figure 26 shows an example on how cities filled in this information.

Outcomes: Identification of actions, solutions and their impacts and benefits related to the risks mapped with the first workshop. This assessment contributes to the preparation for the third workshop on the creation of the adaptive pathways.

Figure 27: Miro board example for workshop II. From the risks mapping to the identification of specific actions and solutions enabling the risks to be mitigated and addressed.



Source: Parma's input from workshop 2.

Workshop 3: Adaptive Pathways analysis and selection

The aim of the final workshop was the creation of different APs based on the actions identified during the second workshop, and the selection of the most suitable path to achieve each city objective. As with the previous workshop, cities were divided into four different tables, based on their climatic zones, to facilitate discussion and collaboration. In each of the tables, two types of templates were provided per city, one was a scorecard table which had the information collected from the Miro board, with space to add the pathways to be created in the workshop. The second template was an X-Y graph style template in which the pathways needed to be mapped.

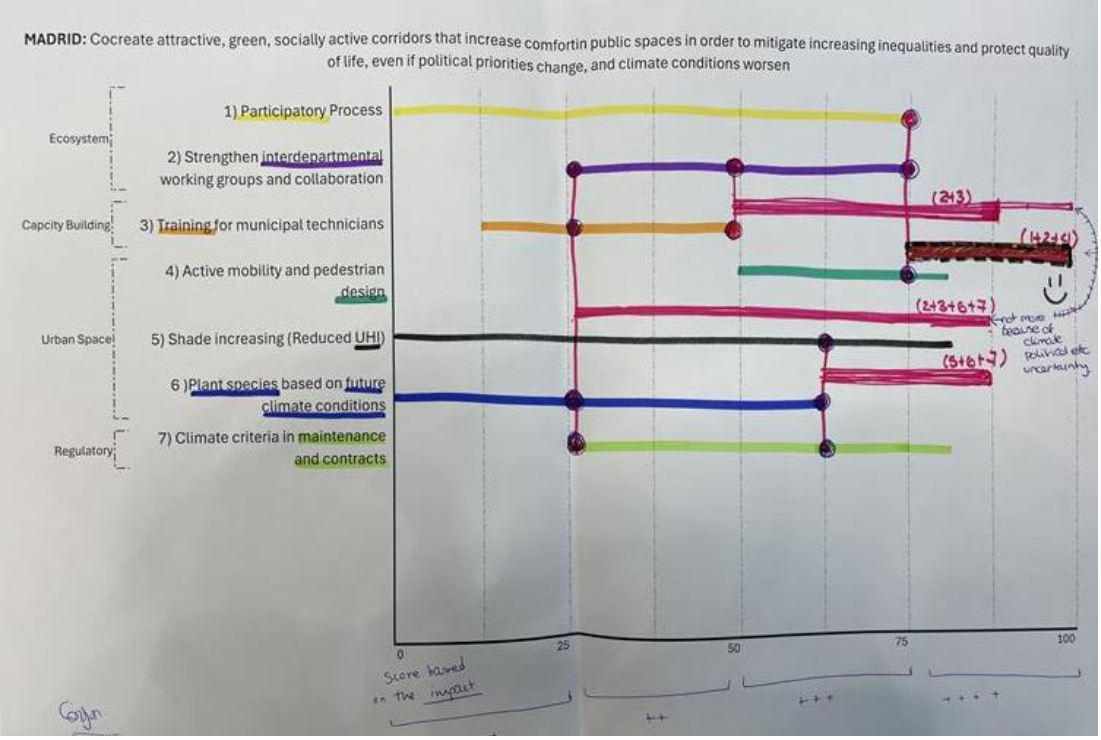
Objective: During the workshop, cities had the chance of revisiting their actions, and re-assess their impact, costs, and co-benefits, in addition to adding any integrative actions they might have overseen, this was done in both the scorecard and pathway templates.

Tools and Process: Cities were divided into four different tables, based on their climatic zones, to facilitate discussion and collaboration. In each of the tables, two types of templates were provided per city, one was a scorecard table which had the information collected from the Miro board, with space

to add the pathways to be created in the workshop. The second template was an X-Y graph style template in which the pathways needed to be mapped. The discussions focused on the way in which different combinations of possible pathways are more feasible and doable in the specific context, or which one of pathway can affect most how to challenge and prevent risks.

Outcomes: The combination of pathways were discussed and mapped (Figure 28), ending with the selection of an Adaptive Pathway they could implement to tackle their risks[30](all the Cities' results are in the dedicated **Annexe II - Adaptive Pathways**).

Figure 28 : Pathways canvas based on the template of the scorecards and the combination of solutions, objectives, impacts and benefits.



Source: URBREATH, City of Madrid (Mediterranean Climatic Zone), General Assembly | Tallinn.

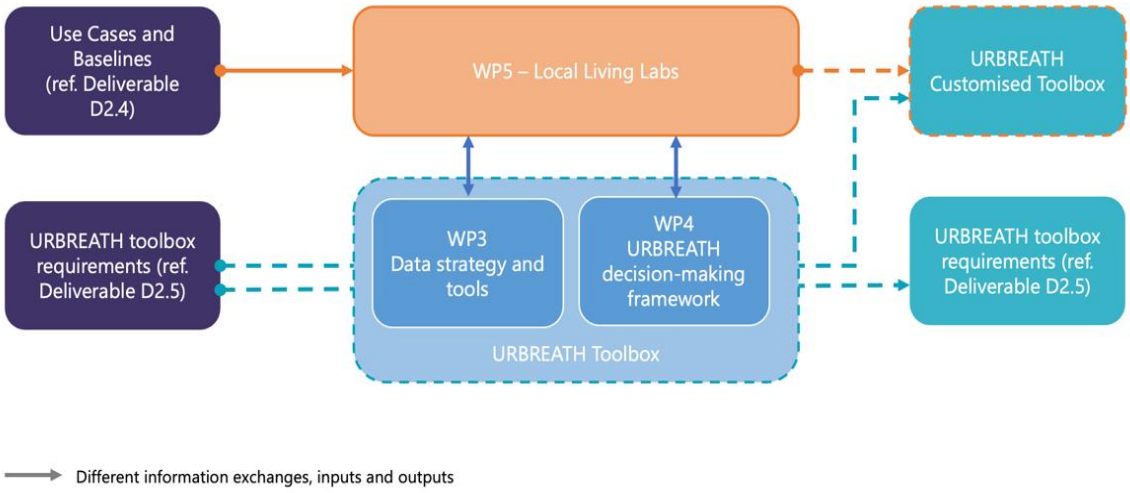
2.3.4 From the URBREATH toolbox requirements to the contextual and local URBREATH toolbox

One of the key objectives of the URBREATH project is the design of the toolbox that could be usable by different cities within different contexts and climatic zones (see also D2.5, submitted in December 2024, and D4.7 - URBREATH NBS ICT integrated solution - V1, submitted in June 2025). In this sense, the work by technical partners (specifically WP3 and WP4, together with WP5 for the customisation and for the

[30] These results were digitalised ed using the Pathway Generator Software created by Deltares.

interface with Frontrunner and Follower Cities) in operationalise and develop the URBREATH toolbox started with some co-creation sessions (see **Section 2.3.1**) where they had the opportunity to better understand the needs of each specific city, based on their prioritised scenarios (see Deliverable D2.4, submitted in December 2024). Figure 29 shows the different relationships with specific reference to inputs and outputs from the different WPs, especially WP2 and its inputs for WP3 and WP4, together with WP5.

Figure 29 : Flowchart of inputs and outputs that enable the design of the URBREATH toolbox requirements, and their customisation.



Credits: Elaboration by the authors.

Most of the discussion started with the in-person General Assembly in Madrid (M10), where technical partners started to understand the list of requirements set by the cities (output of co-creation sessions, see **Section 2.3.1**), and trying to relate these 'desiderata' into specific functionality of the tool. In doing so, the work of the technical partner is twofold: on the one hand, they worked on implementing/integrating specific tools, into a single reference instance of the URBREATH toolbox as a whole, including all the relevant elements that emerged during the 'Workshop III – DATA' (see the dedicated description in **Section 2.3.1**); on the other hand, they tested and assess with all cities the different mapped requirements and functionalities, to validate the possibility on building context-specific functionalities, based on the availability of data.

Implementation/Integration of single tools into the URBREATH toolbox

This process is taking all the technical partners involved in the project to a weekly meeting devoted to understanding how to better implement/integrate the different single tools, into more organic and working toolbox. This work is progressing with testing and continuous work from the technical partners, considering all the issues and challenges that could emerge once implementing/integrating different

functionalities and requirements into a single modular platform.

Objective: To understand how common 'desiderata' and scenarios are feasible from a technical perspective, and to start considering how to make them available into the general URBREATH toolbox.
Tools and Process: This work started right during the initial phase of the project and was boosted after the in-person meeting with the cities during the General Assembly in Madrid, where all the technical partners from WP3 and WP4 align on how to continue the implementation of the functionalities of the URBREATH toolbox, leveraging the hints they received during the roundtable with the Frontrunner and Follower Cities. The main goal was to understand commonalities and differences to integrate and reconsider the requirements already listed together with WP5. Recurring meetings between WP3 and WP4 are happening every two weeks to check internal milestones, and to assess and monitor the updates of the implementation of the single tools.
Outcome: Ongoing implementation of the URBREATH toolbox, in line with common and transversal cities' needs, requirements and functionalities based on data provided by all the cities.

Assessment and testing cities' needs for the customised deployment of the toolbox
This activity is strictly related to the continuous flows of information that technical partners from WP3 and WP4 – together with the support of WP5 – are conducting with Frontrunner and Follower Cities. It started with the co-creation sessions that technical partners were conducting with the identification of specific functionalities based on the prioritised scenarios and the data available (see **Section 2.3.1**), and it continues with the identification of specific KPIs (ref. Task 5.6), and their related data.

Objective: To assess data availability to integrate tools into the specific customisation of the cities' toolbox, and to start the process of deployment of the different tools and functionalities related to cities' needs, based on the KPI (Key Performance Indicators) they would more likely want to monitor and be displayed.
Tools and Process: An analysis of each city KPIs [31] has been drafted to understand 'what' cities would like to measure in their pilots, and 'how' they want the KPI to be measured. After this analysis, the list of 'desiderata' has been taken into consideration by the technical partners to understand whether these KPIs can be measured, based on the cities' input data.
Outcome: Initial consideration on which functionality and how to consider it to include into the different local platforms, together with progressive assessment of data and collection of data through installation of sensors – where needed – or dedicated data – where possible.

[31] This investigation is part of Task 5.6. However, other works and analyses have contributed to identify the preliminary set of KPIs, namely Deliverable D5.1 - Local baselines state and URBREATH revisited requirements and technical framework - V1 with a preliminary list of KPIs - submitted in June 2025.
For those related to Digital Twin for the Frontrunner Cities, check also:

- Deliverable D4.1 - Local Digital Twin and KPIs catalogue for urban NBSs - V1, submitted in December 2024.
- Deliverable D4.2 - Local Digital Twin and KPIs catalogue for urban NBSs – V2, to be submitted by the end of 2025.

For the NBS KPI see Deliverable D4.7 - URBREATH NBS ICT integrated solution - V1, submitted in June 2025.

Demo Cafè Test - Digital Tools

This activity started in M17 (May 2025) and relates specifically with the display and presentation of the different advancements of the URBREATH Toolboox and functionalities to the cities. As mentioned, technical partners (WP3 and WP4) have been working hand in hand with WP5, considering cities specific needs, their use case scenarios, and their data availability. However, all this work was done internally, with fewer interactions with cities, which were asked to work on the collection of data to provide a clear and comprehensive datasets of all the information needed from technical partners.
The 'Demo Cafè' allows technical partners to present their work on the digital tools and their implementation based on preliminary available data from the cities (Figure 30 a,b).

Figure 30: Demo Cafè in Cluj-Napoca (May 2025). Two examples of demonstrations of the dashboard for the URBREATH Toolbox (a), and the URBREATH app (b).

Credits: URBREATH Consortium, General Assemblies in Cluj-Napoca and Tallinn.

Objective: To present both Frontrunner and Follower Cities the work done by the technical partners to develop the URBREATH Toolbox, and its local deployment. It also seeks to create valuable exchanges to be included into the next steps of tools' development.
Tools and Process: The Demo Cafè was tested in person during the GA in Cluj-Napoca (M17), setting up different tables (one for each key functionality of the URBREATH Toolbox), and all the cities had the possibility to get a demonstration of the functionality, how it works within the Toolbox, and how it visualises different data.
Outcome: Technical partners gathered lots of inputs and insights from the Cities about the specific tool they are implementing, which lead to revising the functionality and further implementation towards customisation.

ICT Train the Trainers - Learning by Doing Sessions

After the 'Demo Cafè', Cities express their interest in starting to test and use the URBREATH Toolbox and its related performances, to become more familiar with the interface, the functionalities and to point out bugs and other complex items that need to be solved before the final version can be released.

Furthermore, this activity would allow all Cities to be more focussed on their specific customisation of the platform.

Objective: To showcase the general URBREATH Toolbox and its interface, enabling cities to be trained to use the different tools effectively to convey decision-making processes and enhance discussion along the Local Living Labs activities. This will, on the one hand, enhance the capacity of the pilot to test the Toolbox and, on the other hand, it will help technical partners to get direct feedback on what might be improved, especially in the usability and the user interface.

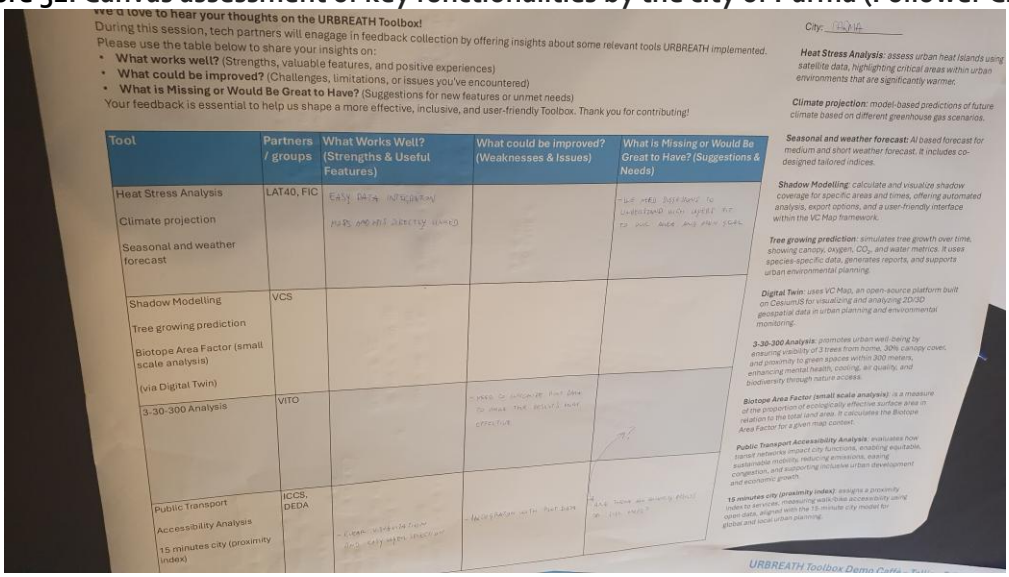
Tools and Process: An ongoing process of training is taken from each technical partner (in charge of the specific development of each tool), with a calendar for all pilots to book their dedicated session. The training sessions are held online and explain to the pilots how to use a specific functionality of the Toolbox.

Outcome: The pilots are able to use the different functionalities of the URBREATH Toolbox and will use them to enhance the public debate and to visualise how different scenarios and strategies they are implementing through Local Living Labs.

Demo Cafè II: Towards Customisation

The second 'Demo Cafè' was organised during the fourth General Assembly in Tallinn. Its aim was to better understand the specificities of each pilot, to be deployed locally in the different local platforms. In doing so, the Demo Cafè focuses on the key functionalities to be applied in the different pilots – using the data they provided – to better integrate pilots' needs and expectations, and to check and assess questions and issues. Figure 30 shows the canvas used for this exercise, and highlights key elements of the related functionality, their challenges to be better integrated in the Toolbox and in the local platform, and its usability.

Figure 31: Canvas assessment of key functionalities by the city of Parma (Follower City).



Source: URBREATH, City of Parma (Mediterranean Climatic Zone), General Assembly | Tallinn.

2.3.5 NBS deployment: Implementation Plan for FRCs and Development Plan for FLCs

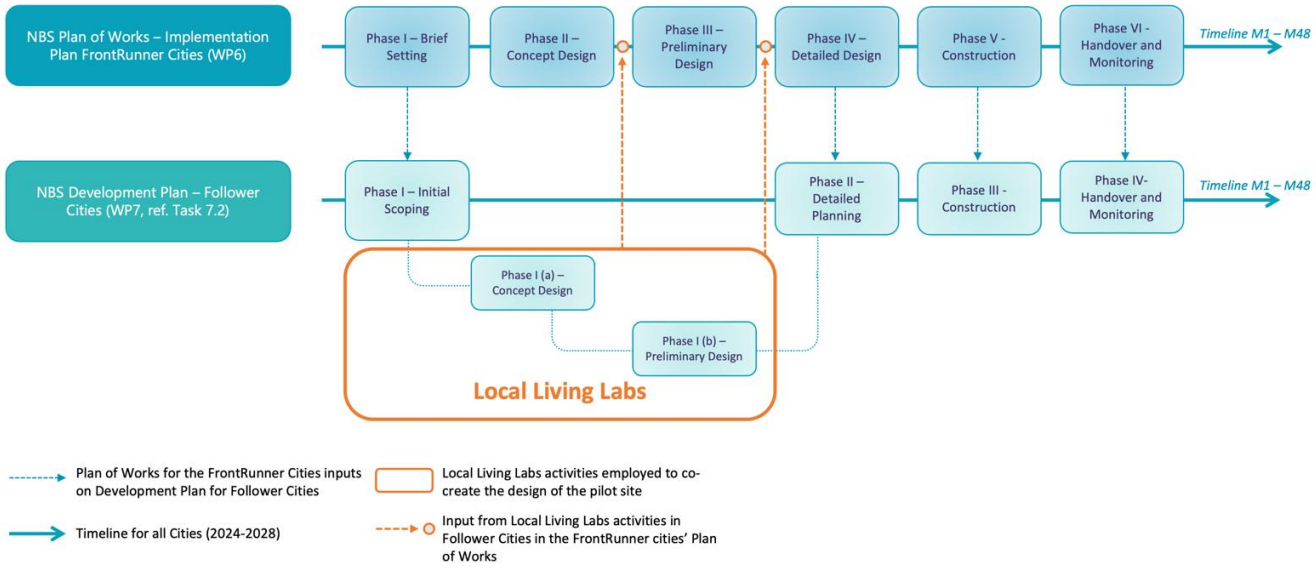
Another important pillar of the URBREATH project is the relation between Frontrunner Cities and Follower ones. In brief, while Frontrunner Cities have to work on an Implementation Plan in their pilot site, ensuring that the specific NBS (discussed and agreed also through Local Living Labs), Follower Cities needs to plan for them, considering the activities performed in the Frontrunner Cities.

Roughly, this section explores the methods and tools used to understand and design a common implementation plan for each Frontrunner Cities, which is also used to compare and customise the different timelines and activities that each City would perform in their pilot site (ref. Deliverable D6.1 - NBS deployment, monitoring and validation plan & report - V1, submitted in June 2025); the same approach of timelines and activities has been used as a replication for the Follower Cities, to better characterise their activities in planning the interventions in their pilots.

Within URBREATH, this staged approach is used as a backbone for monitoring the implementation of the FRCs pilot-site interventions. Looking at the planning and delivery process step by step allows us to focus on the incremental development of each project, identify emerging issues early, and understand how decisions taken at each stage affect subsequent progress. By applying the same structure across all cities, we can compare processes, track changes, and analyse how NBS projects behave within or diverge from conventional design and construction workflows. Using this structured lens also helps highlight where typical planning procedures may restrict, slow down, or otherwise influence the deployment of NBS interventions. The monitoring framework supports the advancement of the Front Runner Cities' implementation plans and construction progress, while ensuring alignment with the wider URBREATH methodology and overall project timeline. It also provides early insight into potential risks, delays, and their implications for testing the URBREATH Toolbox in real-life conditions.

The main elements that both Frontrunner and Follower Cities have to take into account are that NBS have to be co-created together with relevant stakeholders, using the Living Lab approach, and, while considering their scenarios, the digital tools. These activities start to actively operationalise the approach of replicability (Figure 32).

Figure 32: Workstream between Frontrunner Cities Plan of Work and the input for the Development Plan (and replication plan) to be adapted and used by Follower Cities with some integrations and customisation based on the two different levels at which the different timelines work.



Credits: Elaboration by the authors.

NBS Implementation Plan for the Frontrunner Cities

One of the first activity for understanding the state of the art of the pilot site, and begin of considering the implementation plan for the NBS to be deployed, is to frame them into a four-year timeline[32], considering key actions that the cities are going to undertake. In doing so, WP6 elaborates a Work Plan based on the RIBA Plan of Work (see **Section 2.2.7**, and Deliverable D6.1 -NBS deployment, monitoring and validation plan & report - V1, sumbitted in June 2025). In doing so, WP6 starts and progressive interaction with Frontrunner Cities in disentangling their expected outcomes in terms of needs and design, and starts approaching the different stages of the Work Plan for the specific NBS design and implementation. It also considers the other works performed in WP2 (ref. D2.4 - Use Case Scenarios

[32] The 4-year timeline came from the length of the URBREATH project. The Frontrunner Cities were asked to give us a rough timeline of all the actions they were planning and based on the descriptions, we organised them into the correlating planning stages. RIBA Plan of Works also gives a rough outline of the more detailed actions needing to be taken in every stage, so it provides a good framework to compare the specifc paths the FRCs take to a more general framework and see where problems might arise, when planning NBS.

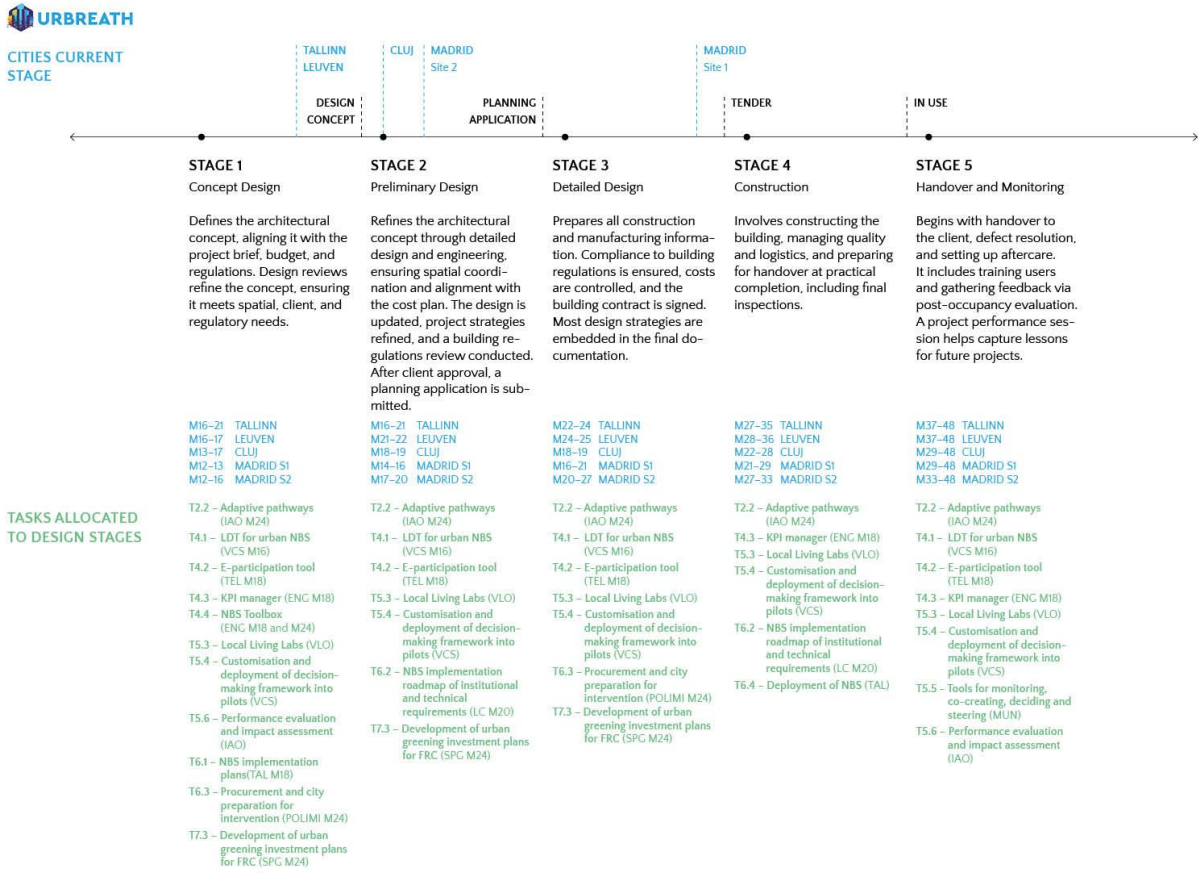
and Baselines), and WP5 (ref. Task 5.3 - Local Living Labs; and Task 5.6 - Performance evaluation and impact assessment).

Objective: To understand the key actions and timelines of each Frontrunner City, considering their pilot site, their needs and the different stages of the RIBA Work Plan in comparison with the timespan of the URBREATH project and its objectives (also considering Living Labs activities and the introduction of digital tools for scenario simulation). These sessions also aim at understanding the main project strategies.

Tools and Process: Two rounds of different one-to-one meetings with cities have been organised, presenting an initial and preliminary Work Plan (based on the RIBA Work Plan stages). A presentation with a timeline has been presented to each City with a guide towards the different steps of the RIBA Work Plan and including already existing materials and information from other workstreams. The cities amended the timeline and included relevant information and other phases to enhance the process and to ensure a smooth coordination and transition from one phase to another.

Outcome: Timeline and Work Plans for each Frontrunner City (Figure 33) has been developed and co-created with the WP6 team, considering their needs and their internal timelines.

Figure 33: Timeline of the URBREATH project, with the different Plan of Works of each Frontrunner City.



Credits: Elaboration by WP6 Leader.

<u>In-person Validation of the Timelines and Design Implementation (Frontrunner Cities) and Development Plan Preliminary Study (Follower Cities)</u>

During the General Assembly in Cluj-Napoca (M17), WP6 focuses its attention on how to further detail the design of the different Frontrunners' pilot sites. At the same time, WP7 shows a preliminary analysis and design of the Development Timeline for their pilot site.

On the one hand, this activity facilitates a discussion about the key priorities of each Frontrunner City, validating the Timelines, and focusing more on the design activity of the pilots (considering that the Frontrunner have diverse places they would like to implement). On the other hand, Follower Cities had the chance to start thinking about their key stages to plan their interventions in their pilots, also with the support of the Frontrunner Cities, which are more advanced and can give support in considering activities and potential actions to be performed for similar outcomes.

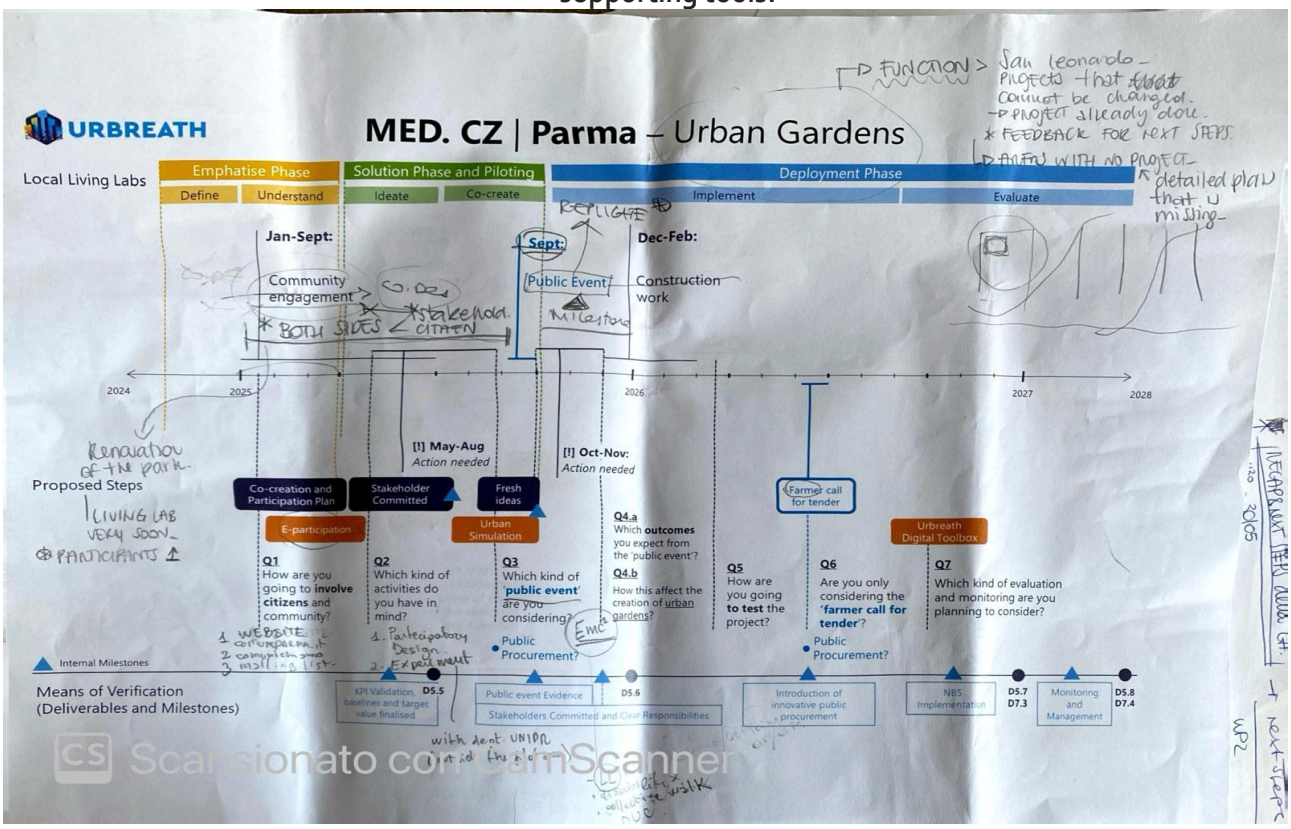
<u>Objective (a)</u>: To deepen the discussion with the Frontrunner Cities about the Work Plan and the

Timeline that have been amended and reorganised by WP6, including a focus on the design and the kind of spatial organisation they would foresee for their pilot.
Objective (b): To allow Follower Cities to relate their preliminary timelines and development plans with the one made and validated by the Frontrunner Cities, and to start brainstorming about the different phases and the activities they are planning to undertake for implementing their pilot site.

Tools and Process: The in-person workshop was organised dividing cities into their related Climatic Zones, and considering two different rounds of discussions: one for the Frontrunner Cities, where Follower Cities have the possibility to learn from already validated timelines and can take the advantage of specific hints from the Frontrunner Cities; and another where Follower Cities have to validate and brainstorm about the preliminary prepared timelines to ensure coherence and a strategic and effective planning of all the activities (also considering the work done for the Local Living Labs).

Outcome (a): For the Frontrunner Cities, the outcome of this workshop was to validate the timelines and the Plan of Work, considering the different stages of the RIBA model. Also, Frontrunner Cities were able to prioritise specific areas of the pilot sites, giving specific hints and guidelines on the design they would like to make.
Outcome (b): For the Follower Cities, a preliminary discussion and brainstorming of the presented timelines with relevant information from the Frontrunner Cities, and an idea on how to plan activities incrementally that can be performed in the time span of the project (Figure 34)

Figure 34: First draft of the Timeline for the Follower Cities Development Plans (in this case, Parma), which includes similar steps to those identified by the Frontrunner Cities' Plan of Work, and investigate all the relationships with the Living Labs (on the top) and their influence in different planning phase, together with the specific use of digital tools enabling the implementation of the phases and as supporting tools.



Source: URBREATH, city of Parma (Mediterranean Climatic Zone), General Assembly | Cluj-Napoca.

Follow-up activities: Desing Concept (Frontrunner Cities) and First Proposal of the Development Plan (Follower Cities)

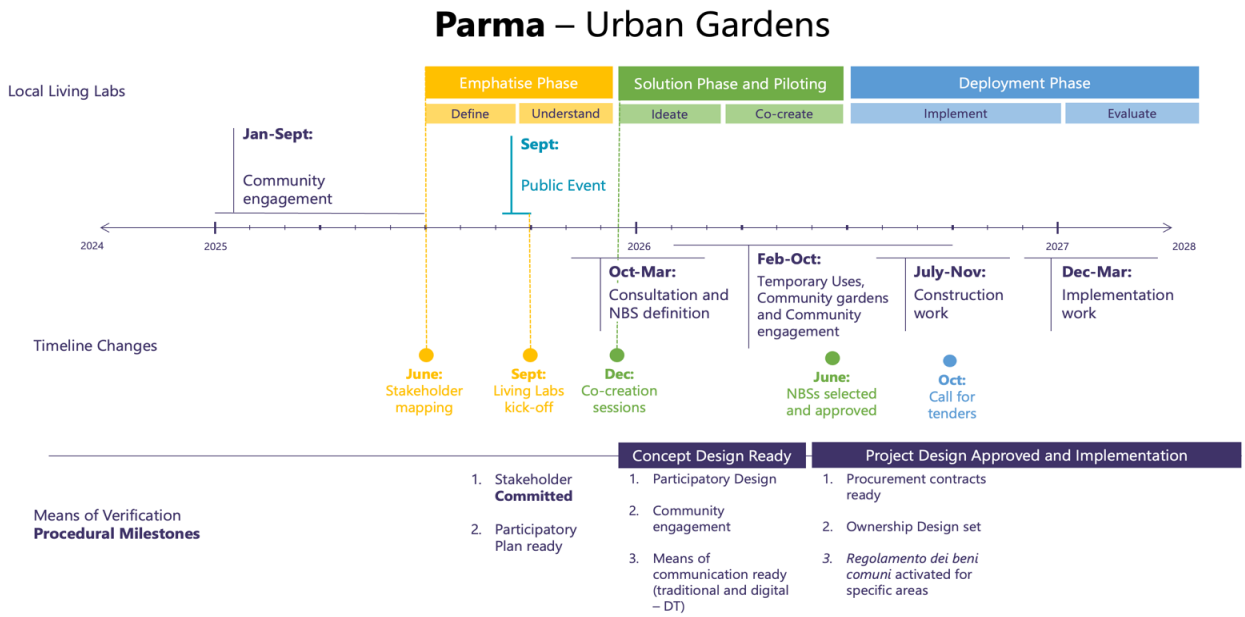
After the feedback received during the General Assembly in Cluj-Napoca, a set of meetings was organised to allow WP6 to finalise and delve deep into sending issues with the Frontrunner, also considering the work to be described in Deliverable D6.1 - NBS deployment, monitoring and validation plan & report - V1 (submitted in M18). During these meetings, Follower Cities were invited to present the second version of their timeline and Development Plan (Task 7.2 - Follower City Project Plan and Development), based on the first input received during the in-person meeting. In this case, more space was given to WP6 to solve any doubts about the Timelines, Work Plans and the Concept Designs, while for Follower Cities the main discussion was based on validating some notes taken during the in-person workshop, allowing Task 6.2 (Customisation of the specific institutional and technical NBS framework) Leaders to rearrange and reorganise the timeline accordingly.

Objective (a): To delve into specific issues and details with each Frontrunner City to better finalise the Deliverable D6.1 - NBS deployment, monitoring and validation plan & report - V1 (submitted in M18) including some preliminary results of the plan of work and the concept design for each pilot sites.
Objective (b): To start a discussion about timelines and development plans with Follower Cities, based on the notes and the hints that have emerged during the in-person meeting.

Tools and Process: Cities –both Frontrunner and Follower – have been clustered by their related Climatic Zone, and a dedicated meeting was scheduled to better understand and validate certain points and pending issues with Frontrunner (concerning their Timelines, Plan of Works and Concept Desing for the NBS), while for the Follower Cities three basic questions have been asked to better interpret and understand the input from the in-person meeting. Together with that, Follower Cities have been appointed to check a working document on which all the specifics about the preliminary set-up of the pilot and the planned activities are.

Outcome (a): To finalise information for the Plan of Work to be included in the first release of Deliverable D6.1 - NBS deployment, monitoring and validation plan & report - V1 (submitted in M18).
Outcome (b): To organise follow-up activities together with the Follower Cities to deepen their Development Plans and understand what their main challenges and opportunities are to implement and frame activities and actions for their pilot site planning and further implementation (Figure 35).

Figure 35: Development Plan V0.2 developed after the discussion with Follower Cities (in this case Parma), considering their input and the comments emerged during the in-person workshop in Cluj-Napoca.



Credits: Elaboration by the Task 7.2 Leader.

Development Plan for the Follower Cities and Activities Report

This activity is devoted to Follower Cities and is a subsequent step in the process of framing and validating their Development Plan. Based on the previous work and discussion with them, the aim of this activity was to present an updated version of the Timeline (Timeline V0.2) and discuss with Follower Cities each phase of the Timeline. In doing so, the cities were also asked to update the working document to make sure that the report and the Timelines are aligned and updated with new information. In this activity to Follower Cities has been also asked to invite to the discussion other relevant departments (e.g. Planning Department, Green Department) to make sure that the timeline and the activities match with the actual work and planning that will be performed until 2027. This activity is a joint work among different WPs, especially:

- WP7, to support Follower Cities on what concerns the activity of the overall Development Plan and Business Models
- WP3 and WP4, to better integrate the state of the art and the digital tools that can enable a better coordination of data and communication, and that can enhance co-creation
- WP5, to support the Follower Cities in performing activities related to Living Labs activities, outputs and expected outcomes for integrating co-creation processes into more actionable and planned strategies for the Development Plan.

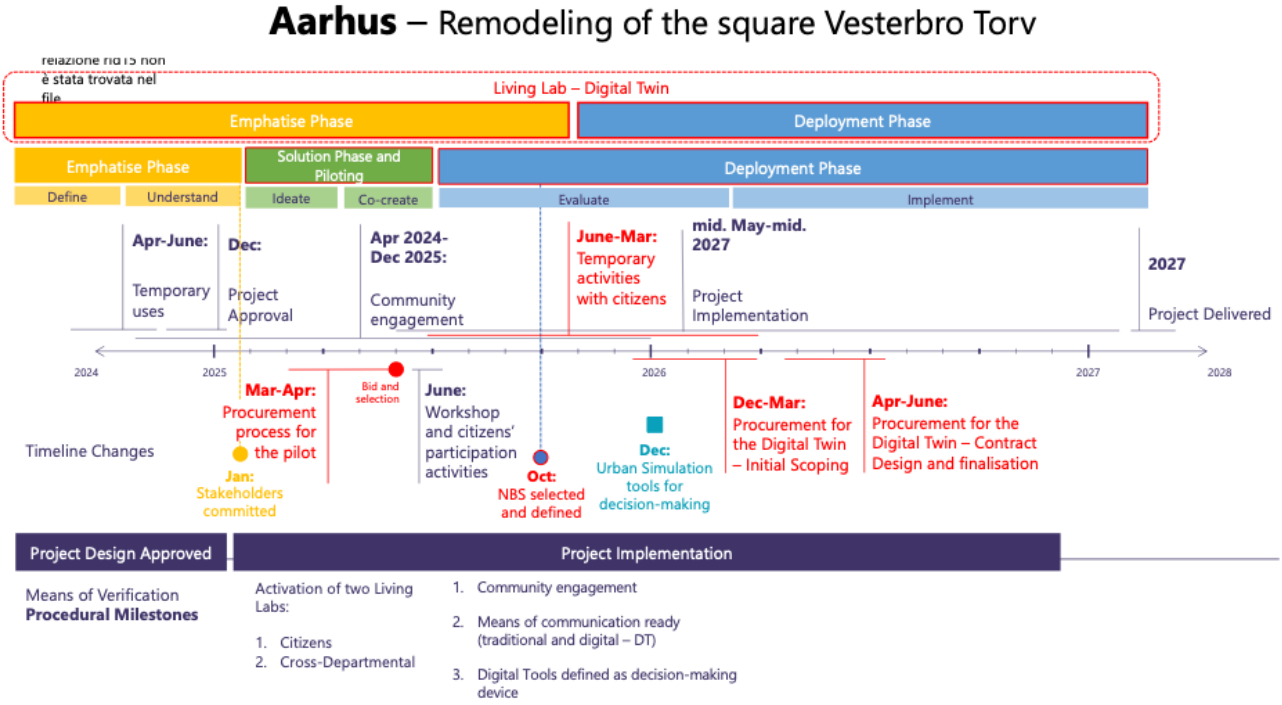
In this way, the validation of the timeline was essential also to better understand which kind of technical support might be needed by Follower Cities in designing and developing their planned activities for the NBS planning and implementation in their pilot site.

Objective: To delve and deep dive into the specific Timeline of each Follower City, considering the planned actions, and relating the specific topic to assess the level of maturity and the need for technical support by different partners in performing actionable and strategic initiatives to enhance the co-creation process of the development plan.

Tools and Process: The organisation of these sessions with the Follower Cities has been organised with five one-to-one meetings and a supporting presentation presenting all the steps of the timeline to get a first validation or further amendments, based on what has already been discussed in previous meetings and workshops. Before the one-to-one to all Follower Cities has been asked to review the working document and the information provided, and to be prepared to discuss the Timeline V0.2. During the one-to-one meeting, the presentation was organised alongside different topics (Baseline and Initial Scoping – Planning; Baseline and Initial Scoping – Digital Tools; Living Labs and Co-creation; Digital Means of Communication and Decision-Making; Green Investments Plan) with specific questions from each WP to better understand the context in which the project of NBS will be positioned.

Outcome: To validate the Timeline and the Development Plan (Figure 36), and to organise and update the Follower City report, with all the information that are missing, following the construction of a robust Plan of Work.

Figure 36: This Timeline represents the amendments form the Timeline V0.2, and the validation of the activities already described, with integration of the red activities which are those that have not been mapped, but that needs to be considered while planning the NBS in the pilot site. Here in the case of Aarhus, that is the validation of the timeline at M20.



Credits: Elaboration by the Task Leader of T7.2 - POLIMI

2.3.6 Public Procurement for NBS provision in FRCs and Business Plan for the FLCs

The topic of procurement in this project has a twofold nature: on the one hand there is the need to understand barriers, obstacles and opportunities on the procurement model used in the Frontrunner Cities (ref. Task 6.3), considering also the Urban Greening Investment Plan (ref Task 7.3 - Development of Urban Greening Investment Plans for Lighthouse Cities) for the actual implementation of NBS in their pilots; on the other hand, procurement and perform capital planning which is also required to Follower Cities to better understand when they are going to plan public procurement procedures in their timelines, and which kind of funds and resources they will use to develop and implement NBS in their pilot sites (ref. Task 7.2 - Follower City Project Plan and Development, and Task 7.4 - Collaborative procurement models and Innovative financing instruments and structures). Similar to the activity of Frontrunner Cities Plan of Works and Follower Cities Development Plans, these activities bring together partners from WP6 and WP7, jointly working on the topic of public procurement and urban greening investment plans.

Public Procurement and Investment Plans baseline and inputs

To better understand the state of the art of such a narrow domain, one of the first activities to be performed was investigating where cities (both Frontrunner and Follower Cities) stand concerning public procurement processes and green investment plans. Considering the different nature of work to be performed with Frontrunner Cities and Follower Cities in this regard, a questionnaire to assess the initial status of each city was sent to start the discussion and to frame the overall context.

Objective: To have a general overview of the status of public procurement processes of Frontrunner Cities and their interest in performing – during the project – certain forms of innovation in public procurement practices. The Urban Greening Investment Plans of the Frontrunner Cities were also essential for understanding the kind of financial resources they can use, and secure to enhance the process of implementing and maintaining the NBS in the pilot site in the long run. For Follower Cities, the aim was to identify the level of interest in innovative procurement procedures, as well as understanding how they are planning to secure funds for the development of the NBS in the future.

Tools and Process: This initial scoping is based on a common questionnaire for the Frontrunner and Follower Cities which was sent out in M16. The questionnaire is based on twenty-six questions on these two macro-topics:

- Fundings and Financing, with specific questions on: (i) current state of funding and financing of NBS; (ii) project investment plan and monitoring; (iii) enabling financial condition for NBS projects, and related sub-questions.
- Innovative Procurement, with questions on: (i) current state of (innovative) procurement model; (ii) procurement for URBREATH NBS project.

The questionnaire was sent to all cities, and it was the starting point for the joint activities with Frontrunner Cities on the Plan of Work, to better understand the economic feasibility of the actions foreseen in the pilot area. There was a similar approach for the Follower Cities. In M17, after the General Assembly in Cluj-Napoca, discussions were held with the cities and which included brainstorming of the possibility of including some 'innovation' elements on the traditional procurement model.

Outcome: To have a first insight into the procurement processes in each city and to better understand their positioning concerning funds and financing opportunities.

In-person insights on Investment Plans and Public Procurement in Frontrunner Cities

During the General Assembly in Cluj-Napoca in May 2025 (M17), follow-up questions were asked to the cities.

Objective: To get clarification on the responses by the cities to the questionnaire.

Tools and Process: An excel sheet was used, where the questions had been prepared, and to document

the answers from the cities. During a workshop at the General Assembly representatives from South Pole rotated among tables with the different cities and asked them the prepared questions, as well as spontaneous follow-up questions, and giving the cities some feedback and input regarding financing and/or procurement.

Outcome: More detailed information about the financing and procurement of the cities' NBS projects.

In-person Public Procurement Model exercise – FRCs and FLCs

Once all the information about public procurement was collected and reorganised, the main focus of the work was to better understand the actual process of public procurement in the Frontrunner Cities (ref. Task 6.3), considering their traditional way of doing these kinds of processes, and introducing the URBREATH procurement model with steps and sub-steps that can enable the compliance with EC Regulation on procurement. The workshop held during the General Assembly in Tallinn (M22) was essential to understand which are the deviations from the 'model', and which are the main challenges and potentials that Frontrunner Cities are facing with their processes to ensure a smooth transition to the URBREATH model. At the same time, Follower Cities could learn the ways of doing public procurement from the Frontrunner Cities. During this in-person exercise the Follower Cities were engaged to assess specific questions for the Frontrunner Cities concerning their public procurement process, and then checking which kind of elements they consider *desiderata*[33] for their 'innovative' public procurement process.

Objective: To understand how Frontrunner Cities are dealing with public procurement processes and especially the backbone of their procurement process, considering their planning culture and the EC regulation on procurement. Furthermore, this activity helps in defining which kind of elements are important to be taken into account for Follower Cities that would like to perform innovative procurement based on the model (for more information, please check Deliverable D6.7 -Procurement and city preparation for NBS intervention - V1, submitted in December 2025), and the input from the Frontrunner Cities.

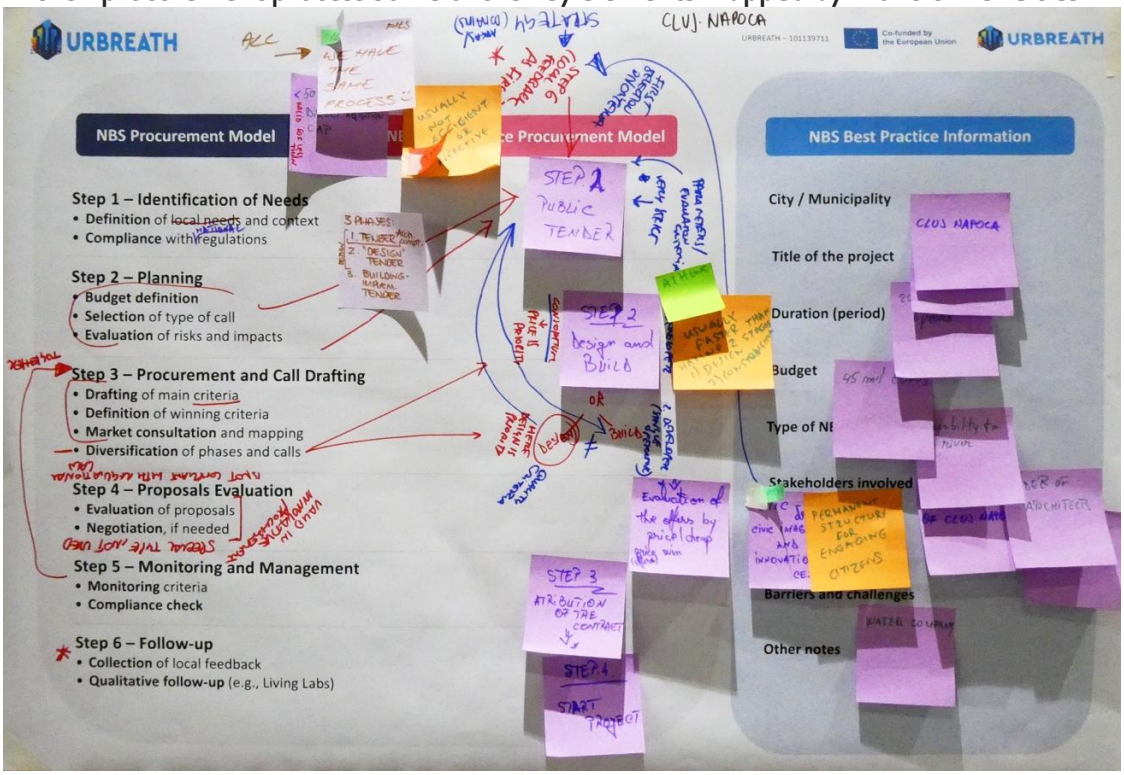
Tools and Process: The process for assessing this information was based on the preparation of a 'public procurement model' designed along different steps and sub-steps that need to be taken into account while considering the European Regulation on public procurement (for further information on the model and its features, see D6.7 - Procurement and city preparation for NBS intervention – V1, submitted by December 2025). The in-person workshop was designed for the Frontrunner Cities to investigate one best practice in their city, which they consider valuable and interesting from the

33 Desiderata refer to the essential qualities or requirements that guide a project or system towards its objectives. They typically encompass functional aspects, such as usability and reliability, and non-functional considerations, including security and scalability. Organising these items into clear categories ensures they remain actionable and aligned with strategic goals.

procurement perspective, and considering the draft model of public procurement. In this way, the activity consisted in assessing deviations from the model, also considering key elements that should be taken into account for the different Climatic Zones. At the same time, Follower Cities were asked to moderate the discussion with their respective Frontrunner City within their Climatic Zone to learn about their public procurement procedures, and then considering all options available to the four Frontrunner Cities: this enables peer-to-peer learning and is helping Follower Cities to derive important elements and steps that they might not have considered for their procurement processes.

Outcomes: With this exercise, Frontrunner Cities were able to assess their traditional way of public procurement processes in comparison with the procurement model presented. It enhances the investigation of steps and activities that could be taken into consideration while pursuing the bid. At the same time, Follower Cities had the chance to learn about experiences and best practices from the Frontrunner Cities, and also checking and verifying if some of the steps presented also could be useful in their specific procurement process.

Figure 37: Canvas used for discussing the procurement model for the Frontrunner Cities, based on a NBS best practice. Follower Cities used red and green sticky notes to map out the potentials of including in their procurement process some of the key elements mapped by Frontrunner Cities.



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

3 Further activities and steps

This final section outlines the next activities to be implemented before the release of the third version of the URBREATH Methodology in December 2026. 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 last version of the methodology will focus on a set of key elements:

- The progressive updates of activities related to each identified application of the methodology, for better understanding the process, the interconnections and the activities that have been performed to reach specific goals (e.g. digital tools deployment; Local Living Labs and co-creation processes enhancement and feedback loops; implementation of the NBS in Frontrunner pilot sites and the Development Plan for Follower Cities).
- The integration of the Adaptive Pathways methodology into a broader scenario, in collaboration with NetZeroCities project, to make it replicable.
- The inclusion of a set of replicable and reusabe canvases enabling the URBREATH methodology to be adopted within specific processes of understanding, or as a modular and single exeprience and activity.
- The means of validation through which the methodology has been able to assess milestones and outcomes throughout the project.

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5 Annexes

Annex I: 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 have been 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 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 in two steps: (i) mapping and filtering, and (ii) assessing 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 **Annexe I-b**). This step analyses the varying degrees of participation that the platforms allow through their different features and functions.

I.I Mapping and Filtering: First set of e-participation tools

The first mapping on e-participation tools results in a combination of 122 (**Annexe I-a**), taken from different references, such as Shin et al. (2024), and ORBIS (ORBIS, 2022)[34]. 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

[34] 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'[35]. 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*[36]). 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*[37] 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*[38] 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[39]).

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

[35] 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.

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

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

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

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

- **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[40] or Consul[41]).
- **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*[42], 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[43], AGPL[44], 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[45].
- **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

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

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

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

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

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

[45] 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).

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.

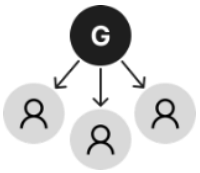
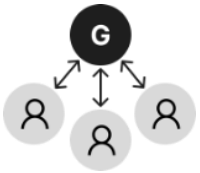
I.II E-Participation platform candidates: levels of participation and functionalities.

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:

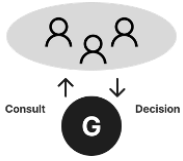
- **Communication Component (CC)**, which supports only one-way dissemination of information (e.g., digitised information on the government website and email distribution lists, recorded audio and videos).
- **Deliberation Component (DC)**, which supports two-way interactions that enable citizen communication and deliberation (e.g., feedback forms, chat tools, interactive discussion boards, electronic petitions, blog posts); and
- **Voting Component (VC)**, which entails citizens' empowerment to take part in 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 to 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: Digitised 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,	Real-time communication (Shin et al., 2024) Open suggestions: Brainstorming, idea proposal. (Shin et al., 2024)	

	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.		
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.	<u>Decision-making:</u> Voting, prioritization, Poll	

Source from: Mariani et al. (2025). Re-elaboration by 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 **Annexe I-b**).

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.

Annexe I(a): List of e-participation tool mapped

Here are listed all the 122 e-participation platforms that have been used to benchmark the most 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	Brazil	0	1
ElectionBuddy	Active	Multi-purpose	Cross-context	Yes	https://electionbuddy.com/	Canada	1	0

Engagement HQ	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/	N/D	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	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/	Germany	1	1
Local Voices Network	Active	Not valid	Cross-context	Not declared	https://lvn.org/about/	USA	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
YourPrioritie s	Active	Multi-purpose	Cross-context	Yes	https://www.yrpri.org/domain/3	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 Republic	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
Humanitaria n	Active	Multi-purpose	Cross-context	Yes	https://www.hotosm.org/	USA	0	0

OpenStreet Map Team								
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/	N/D	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	Germany	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 I (b): Features of the shortlisted e-participation tools

This annex lists out the human-to-human features and their source for the 10 selected tools with the columns '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 possible the creation of posts or news, and to navigate them chronologically.	Information	Inform

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 digitise 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 assemblies	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 integration	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 real-time	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

Annex II: Adaptive Pathway methodology results per city

Cities' Results

Based on the activities with cities to understand and design their adaptive pathways, Table 4 presents an overview of the more recurring risks across the different Climatic Zones, and the main actions related to the prevention of resolution of this risk. The complete results of the cities for each workshop can be found in **Annexe II-a.**

Table 4: Summarised URBREATH Cities' process

Climatic Zone	City	Objective	Risk Examples	Actions (AP selected in bold)
ATL	Leuven	Make the square climate adaptive and pleasant for citizens, despite possible resistance	-Budget cuts -Incomplete data -General maintenance -Enhanced climate change -Decrease biodiversity	1)Approval of all steps 2)Explanation using subjective & objective arguments 3)Resources to integrate change 4)Better company culture & salaries 5)Economic Solutions & innovative funding 6)Budget for data 7)Climate adaptation design and biodiversity considered from the start 8)NBS considered in future renovation strategies
ATL	Aarhus	Handle 100-year incidents of rain and flooding + make the area more liveable to create a green and peaceful inner-city for the citizens, even in changing political priorities	-Polycrisis -Shift in leadership focus -Lack of organisational knowledge sharing -Lack of data maintenance -Lack of ownership	1)Data and process documentation 2)Commitment from Stakeholders 3)Robust Economy 4)Organisation: Strategies+ Documentation+ Engagement 5)Political: Documentation & Strategies
BOR	Tallinn	Make sea-side accessible +	-Green gentrification	1)Access path and lighting in the area

		implementing NBS solutions to create multi-usage, safe, and green shared urban spaces + reduce the polluting effects of snow meltwater, even in changing political priorities	-Democratic deficit -Safety -Limited public access -Working in isolated silos	2)NBS instructions database for municipality 3)Cooperation toolkit for the municipality 4)Campaigns & communication 5)Creative landscape 6)NBS
BOR	Kajaani	Precent environmental load from snow melt waters to improve the quality of water, even if snowfall increase	-Maintenance of NBS -Global warming & increase in snow melt -Budget cuts -Increase litter in the snow -Increased transportation cost of snow	1)Water treatment system for snow melt water 2)New snow dumping location 3)Campaigns to remove invasive species 4)Reduction of litter in snow 5)Communication campaigns 6)Reduction of harmful substances/pollutants in snow
CONT	Cluj-Napoca	Adapt degraded sites to local needs + enhance quality of life through affordable green transformation and foster public participation. Test DT solutions for new intervention locations and ensure e-participation is engaging and user friendly	-Maintenance landscaping -Climate change -Demographic change -Lack of knowledge transfer between departments -Low engagement	1)Strengthen cooperation with green space department 2)Better involvement of local NGOs 3)Collaboration with local actors for biodiversity related actions 4)Leverage on external actors 5)Actions for outreach to citizens 6)Educative & creative info. Panels 7)Capacity building with citizens 9)Monitoring actions 10)Political will

				11)Maintenance post project
CONT	Pilsen	To be a vibrant, welcoming city to offer a high-quality life for all, even if circumstances change	-Energy safety & blackouts -Decrease in biodiversity -Talent & brain drain -Water scarcity -Urban resilience	1)Plant Control for water savings 2)PVE in municipal buildings 3)Participation in EU projects 4)Dedicated areas to be "in the wild" 5)Innovation Ecosystem 6)Micromobility, pedestrian 7)Monitoring 8)Pedestrian zones 9)Microclimate Trees
MED	Madrid	Co-create attractive, green, socially active corridors that increase comfort in public spaces to mitigate increasing inequalities and protect quality of life, even if political priorities change, and climate conditions worsen	-Social disconnection -Vulnerability in mobility and transportation -Climate maintenance blind spots -Increasing extreme weather events -social climate opposition	1)Participatory Process 2)Strengthen interdepartmental workgroups and collaboration 3)Training for municipal technicians 4)Active mobility and pedestrian design 5) Reduce UHI 6) Plant species based on future climate conditions 7)Climate criteria in maintenance and contracts
MED	Athens	Enhance urban cooling and biodiversity to mitigate heat island effects and support ecological resilience, even if extreme heatwaves become more frequent and prolonged. And	-Secure funds for maintenance -Heritage preservation vs NBS -Data availability -Political constrains -Integrated green areas	1)Urban greening/ green corridors 2)Permeable and light-coloured pavement 3)Policy: Efficient transport/electric mobility 4)Policy: Energy efficiency building 5)Participatory process

		promote sustainable mobility and inclusive public space to improve accessibility and quality of life for residents and visitors, even if transport policies or community preferences change over time.		
MED	Parma	Reduce heat island, thermal stress, and flooding risks to transform the neighbourhood into a healthier, safer, and welcoming urban space, even if climate change pressures intensify, urban dynamic shift, and community needs change	-Lack of maintenance -Structural limits -New urban scenarios -High maintenance costs -Efficiency of NBS	1)Parking regeneration 2)Urban Climate refuges 3)Community gardens 4)Green roofs 5)Bioclimatic mobility hubs 6)Resilient streetscapes 7)Reforestation & agroforestry 8)Renewable energy communities

Annex II-a: Adaptive Pathway methodology results per city

This annexe provides all the information and input form the different Cities, and it focuses on the preparation and design of Adaptive Pathways. Combining the three workshops (mentioned in **Section 2.3.3**) the aim of this annexe is to deep dive into the different Frontrunner and Follower challenges and derive specific adaptive pathways.
The document is organised according the the Climatic Zone subdivision:

- Atlantic Climatic Zone, with the Leuven (FRC) and Aarhus (FLC).
- Boreal Climatic Zone, with Tallinn (FRC) and Kajaani (FLC).
- Continental Climatic Zone, with Cluj-Napoca (FRC) and Pilsen (FLC).
- Mediterranean, with Madrid (FRC), Parma and Athens (FLCs).

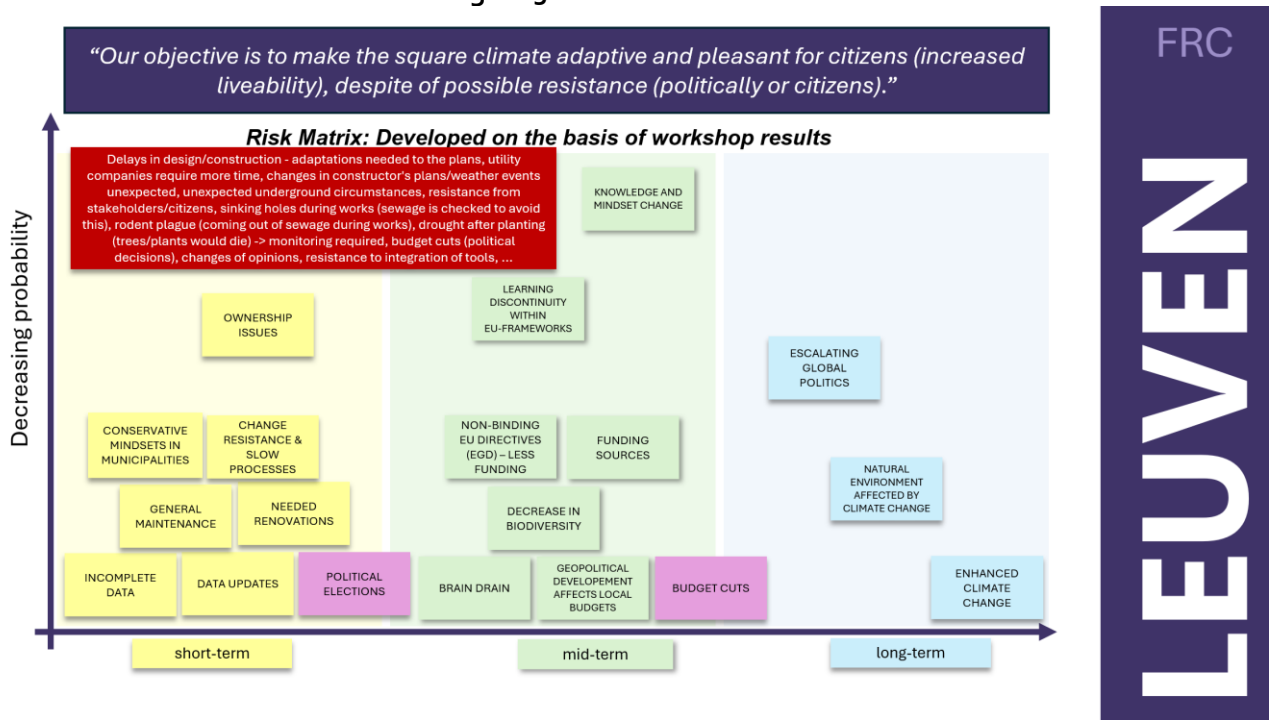
Atlantic Climatic Zone

Leuven

Workshop 1

Leuven identified a variety of risks related to its objective, with two of them classified as recurrent risk: “Political Elections” and “Budget Cuts”.

Figure 38: Leuven risk matrix

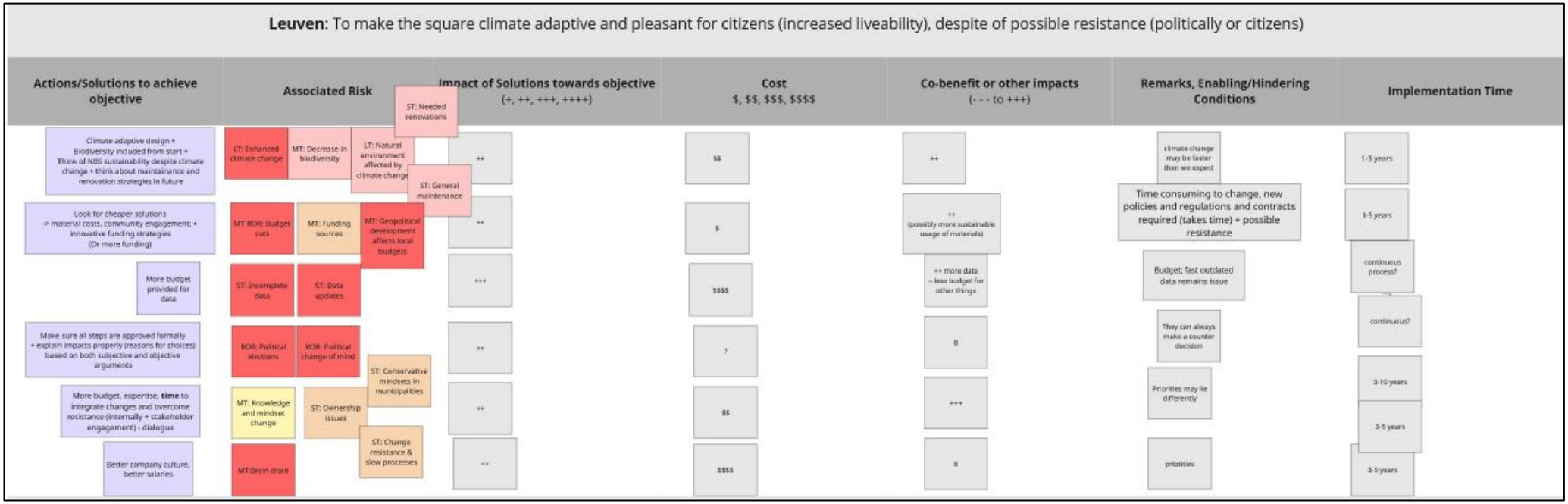


Source: Information gathered from workshop 1

Workshop 2

During this workshop, six different actions were identified, which tackled almost all risks. Only three were left out: “Escalating global politics”, “Learning discontinuity within EU-Frameworks”, and “Non-binding EU directives (EGD) – less funding”, which were mid- and long-term risks.

Figure 39. Leuven actions identification



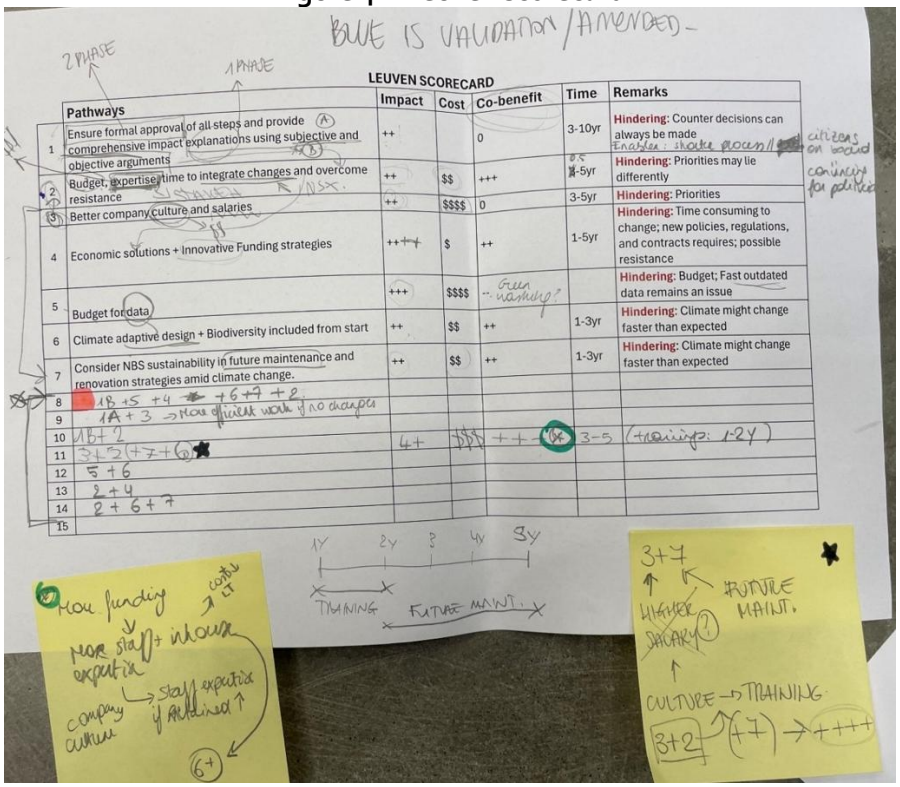
Source: Information gathered from Miro board used for workshop 2

Workshop 3

During the third workshop, one of the actions was subdivided into two (1A and 1B). The agreed pathways can be seen highlighted in green in the Excel table.

Additionally, the team discussed on how changes cannot occur without considering economics solutions, and the importance of having budget for data, since it supports decision-making, design, and monitoring of solutions.

Figure 40. Leuven scorecard



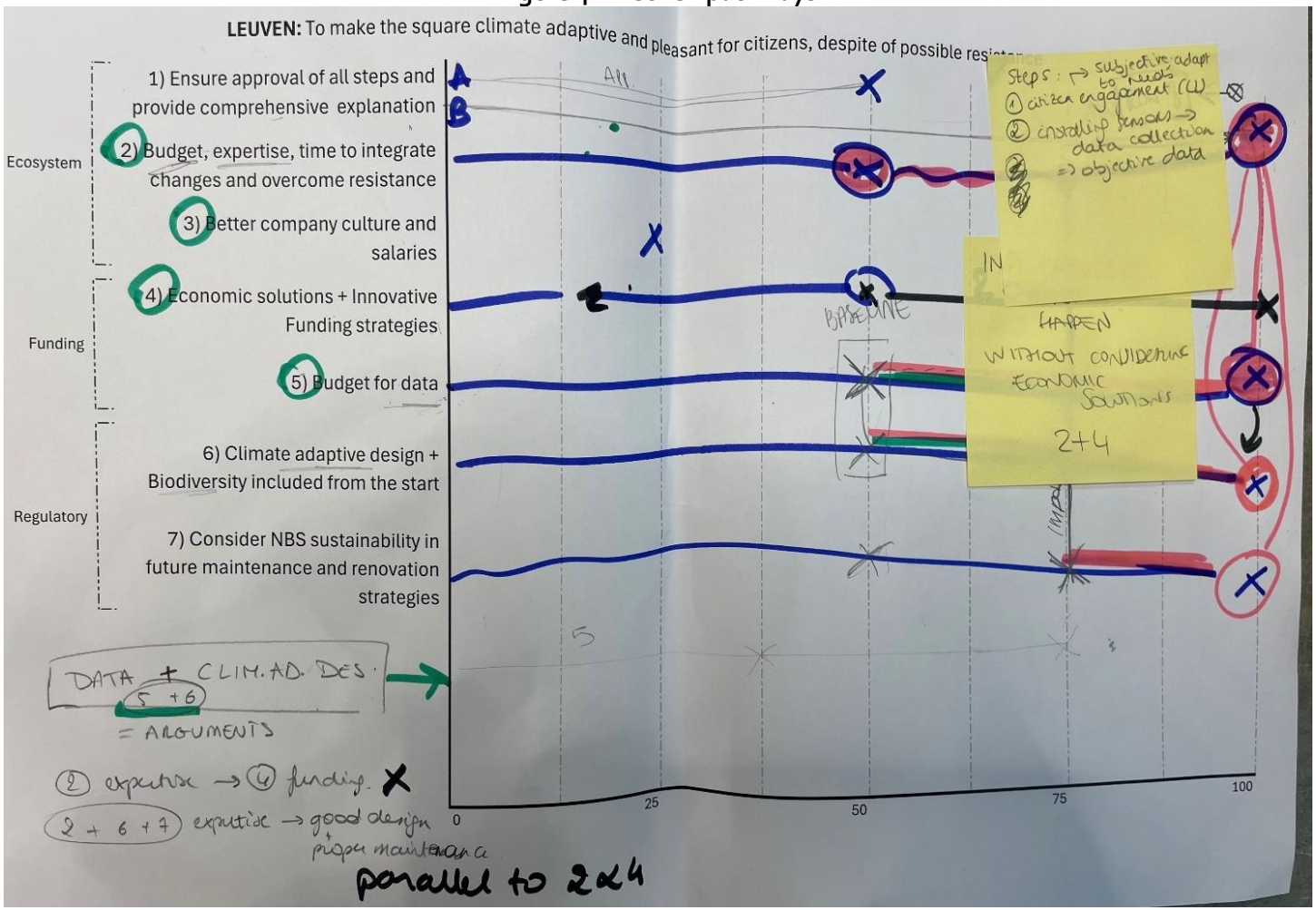
Source: Scorecard filled in during workshop 3

Figure 41. Leuven digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Current Situation	0	0	0
Ensure approval of all steps	++	0	0
Explanation using subj.&obj. arguments	++	0	0
Resources to integrate change	++	++	+++
Better company culture & salaries	++	++++	0
Economic solutions & innovative funding	++	+	++
Budget for data	+++	++++	--
Climate adpt. design & biodiv. from start	++	++	++
NBS considered in future renovation strat.	++	++	++
Ensure approval of all steps + Better company culture & salaries	++	++++	0
Explanation using subj.&obj. arguments + Resources to integrate change + Economic solutions & innovative funding + Budget for data + Climate adpt. design & biodiv. from start	++++	+++	+++
Ensure approval of all steps + Better company culture & salaries	++	++	0
Explanation using subj.&obj. arguments + Resources to integrate change	++	++	0
Climate adpt. design & biodiv. from start + NBS considered in future renovation strat. + Better company culture & salaries + Economic solutions & innovative funding	++++	+++	+++

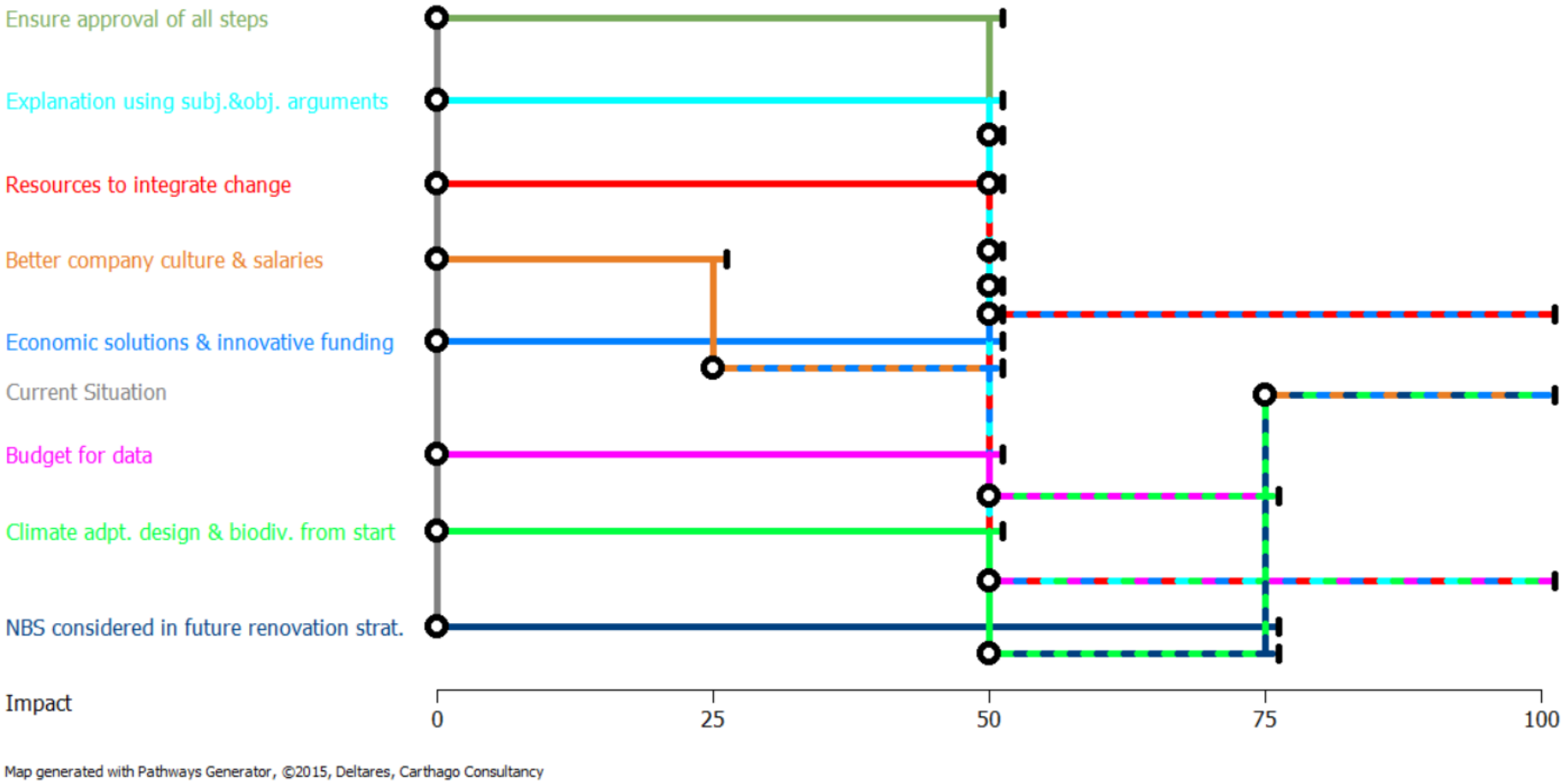
Source: T2.2 result digitisation

Figure 42. Leuven pathways



Source: Pathways filled in during workshop 3

Figure 43. Leuven digitised and approved pathways



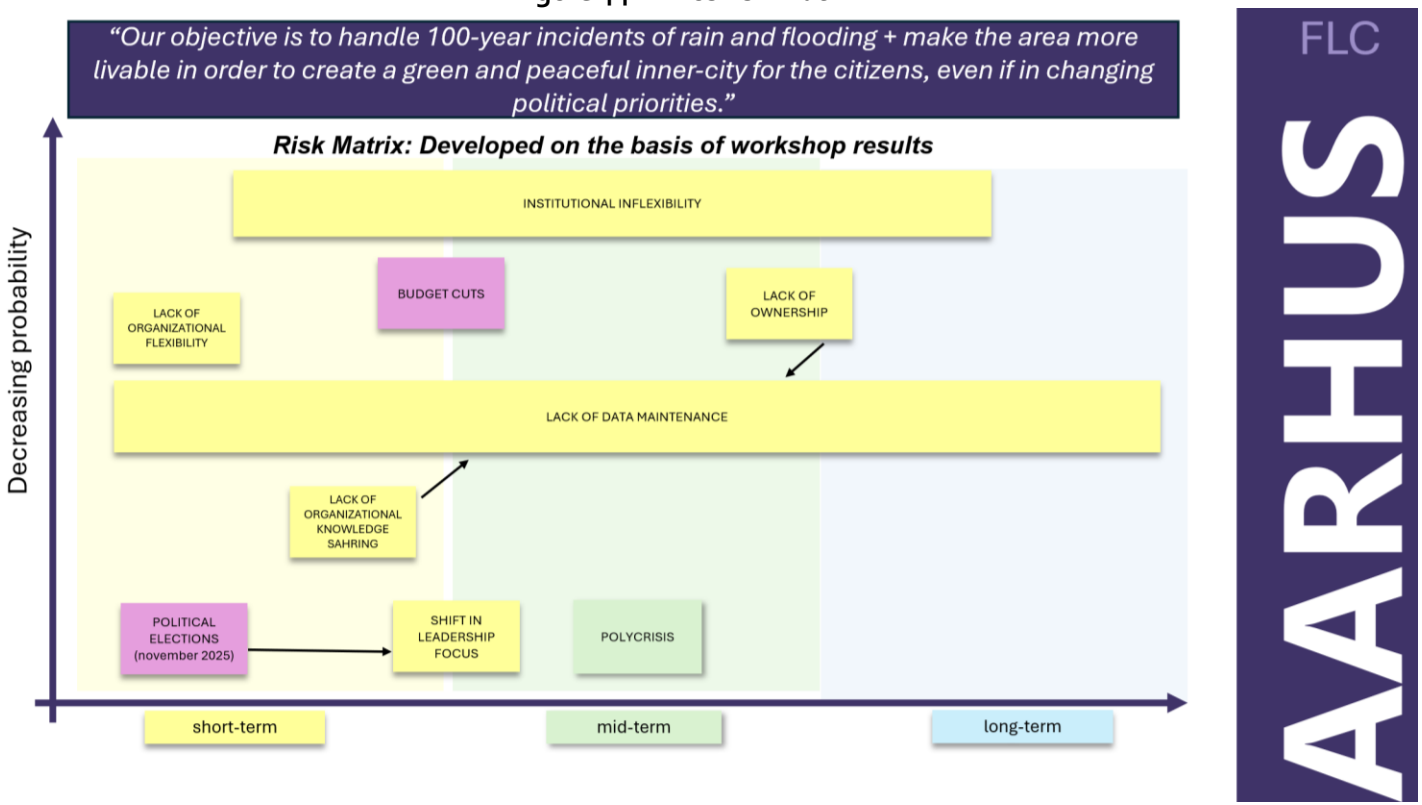
Source: T2.2 result digitisation with Pathways Generator

Aarhus

Workshop 1

Aarhus identified two risks as recurrent: “Political Elections” and “Budget Cuts”. While other two risks were catalogued transversal to the short-, medium-, and long-term.

Figure 44. Arhus risk matrix

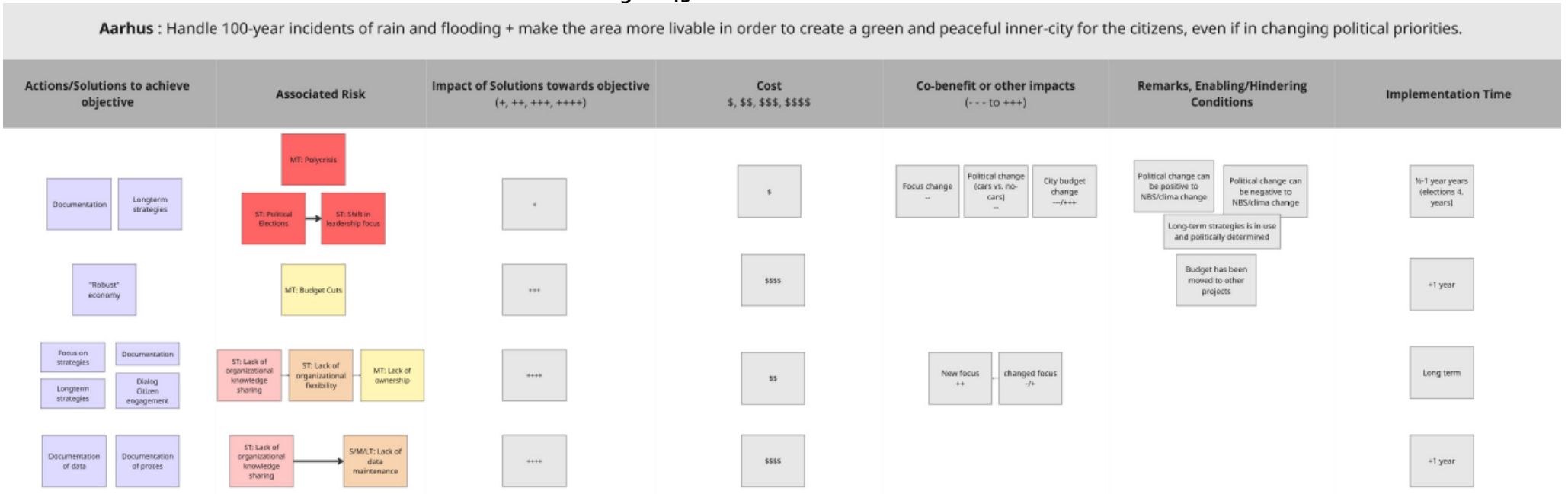


Source: Information gathered from workshop 1

Workshop 2

During this workshop, nine different actions were identified, which considered almost all risks, except "Institutional inflexibility".

Figure 45. Aarhus actions identification



Source: Information gathered from Miro board used for workshop 2

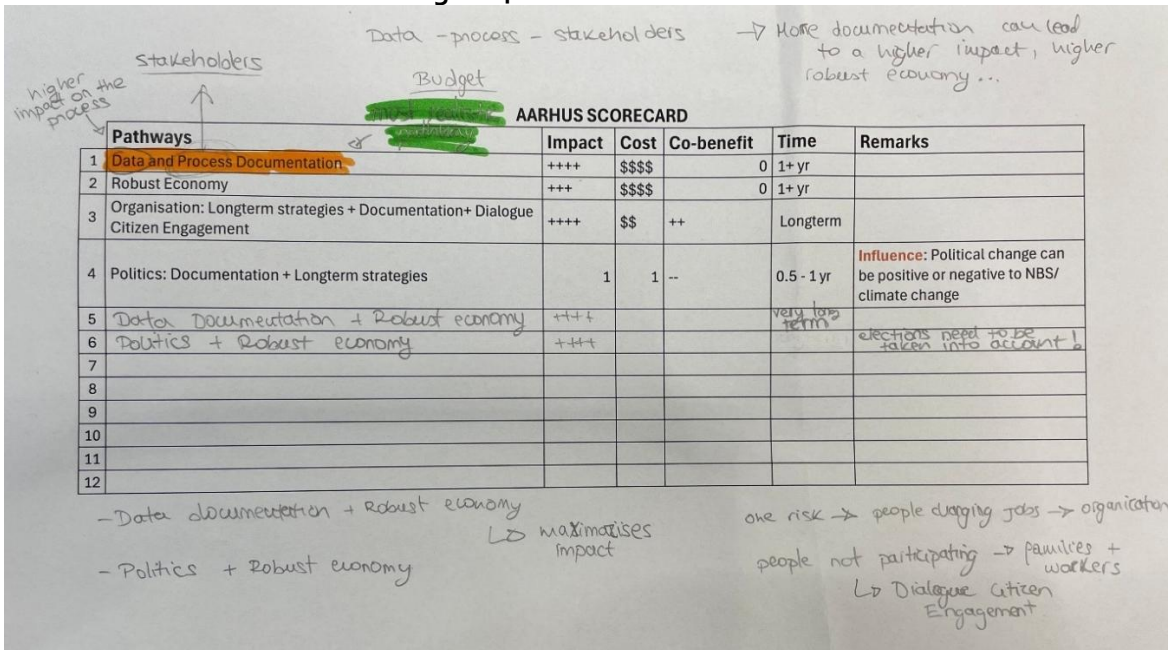
Workshop 3

During this workshop, an additional action, "Commitment from Stakeholders", was added which can be observed on the pathways graph.

Additionally, discussions on the considerations to have for the two created pathways solutions occurred, on which they mentioned the issue of people changing jobs which impacts the organisation, and people not participating, and the importance of citizen engagement. Regarding the last point, it was also mentioned how lack of different generations in citizen engagement can impact actions, and how this can be mitigated with cultural places for the involvement from different generations.

Furthermore, the team discussed how the Digital Twin can support the "Data and Process Documentation" action.

Figure 46. Aarhus scorecard



	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Data and Process Documentation	++++	$$$$	0	1+ yr	
2	Robust Economy	+++	$$$$	0	1+ yr	
3	Organisation: Longterm strategies + Documentation+ Dialogue Citizen Engagement	++++	$$	++	Longterm	
4	Politics: Documentation + Longterm strategies	1	1	--	0.5 - 1 yr	Influence: Political change can be positive or negative to NBS/ climate change
5						
6						
7						
8						
9						
10						
11						
12						

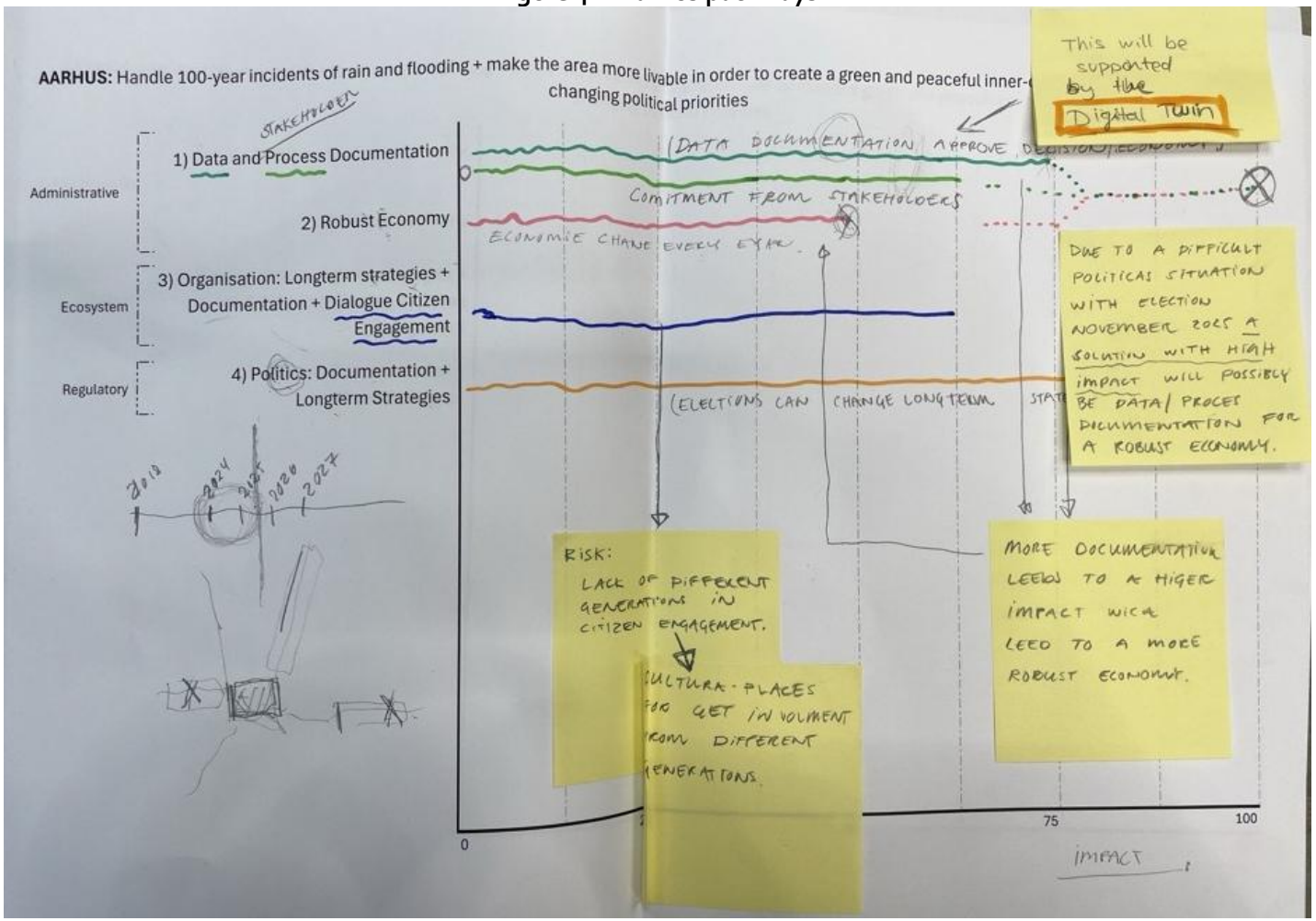
Source: Scorecard filled in during workshop 3

Figure 47. Aarhus digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Data & Process Documentation	++++	++++	0
Commitment from Stakeholders	+++	0	0
Robust Economy	+++	++++	0
Org.:Strat.+Doc.+Engagement	+++	++	++
Politic: Doc. and Strategies	++++	+	--
Data & Process Documentation + Commitment from Stakeholders + Robust Economy	++++	++++	0
Politic: Doc. and Strategies + Robust Economy	++++	0	0

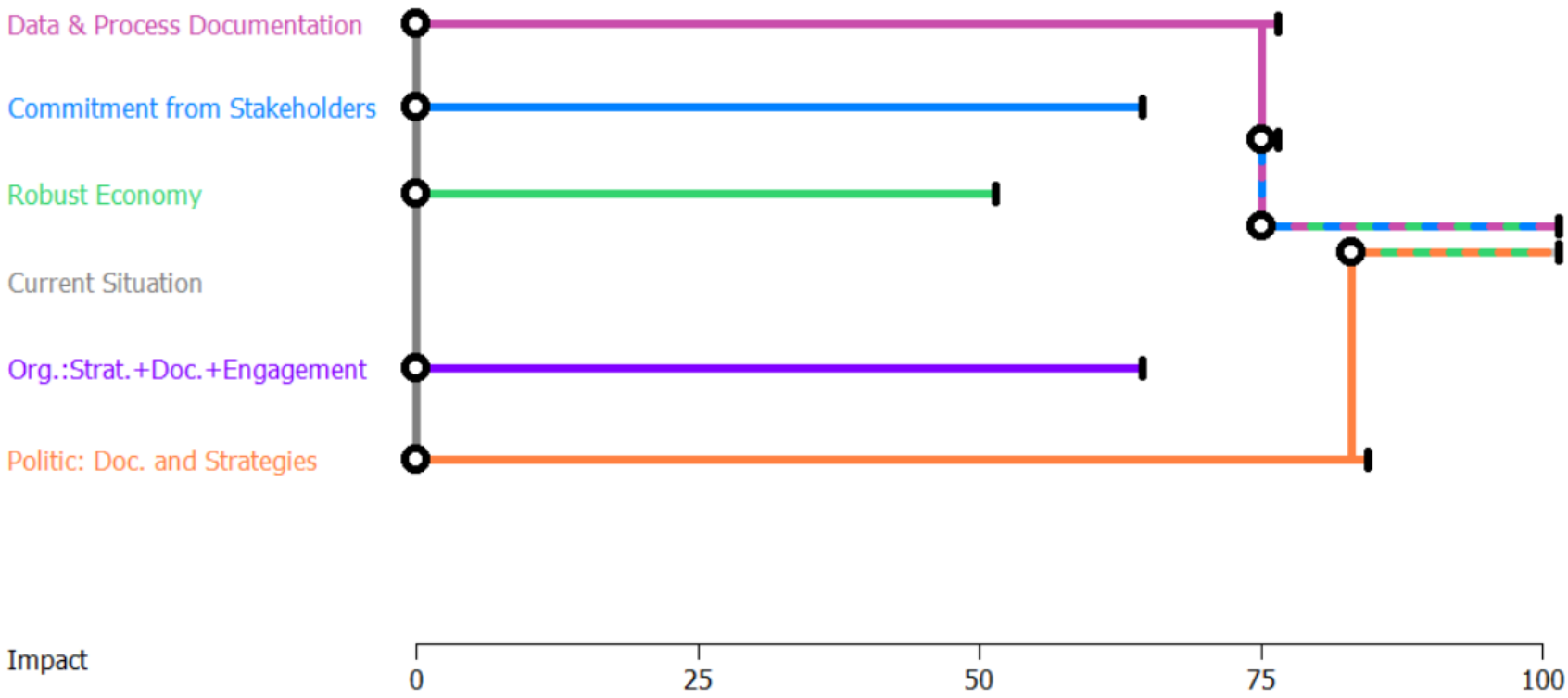
Source: T2.2 result digitisation

Figure 48. Aarhus pathways



Source: Pathways filled in during workshop 3

Figure 49. Aarhus digitised and approved pathways



Source: T2.2 result digitisation with Pathways Generator

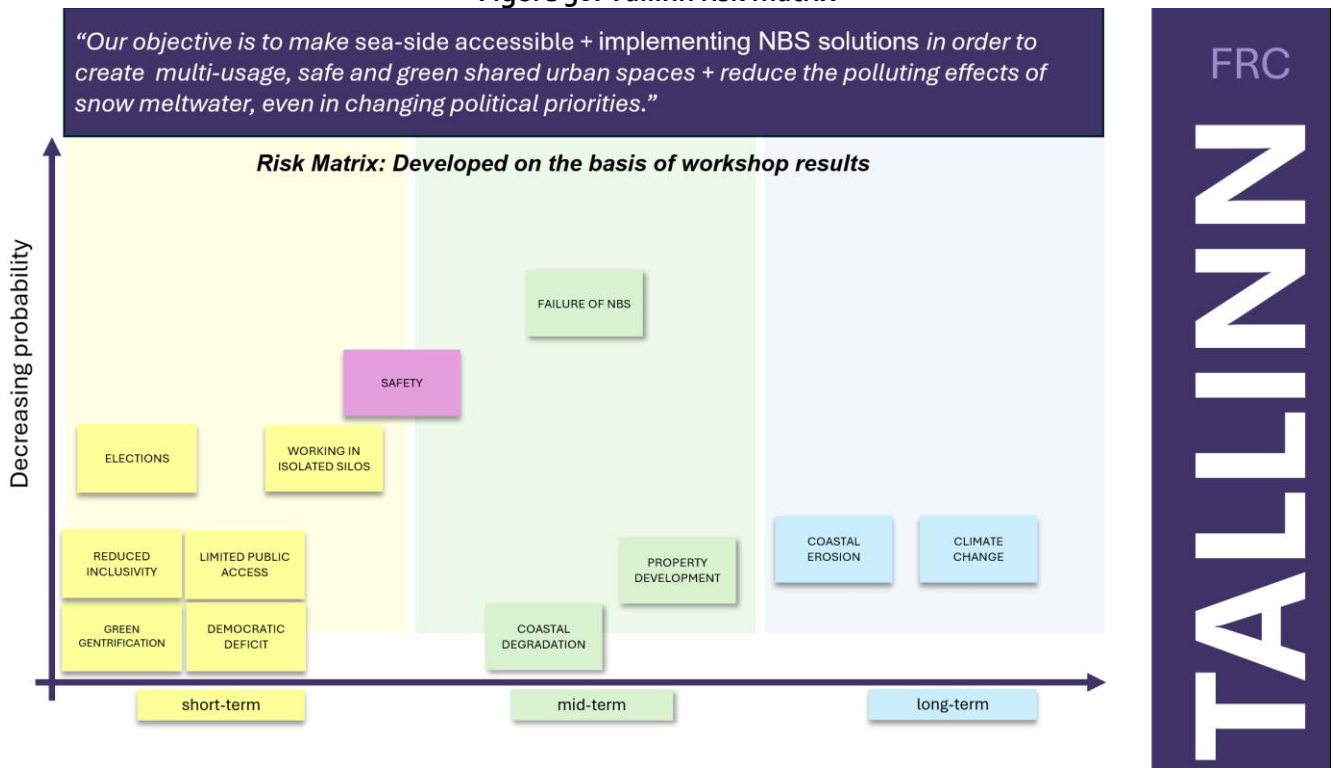
Boreal Climatic Zone

Tallinn

Workshop 1

During this workshop, "Safety" was the only recurring risk identified.

Figure 50. Tallinn risk matrix

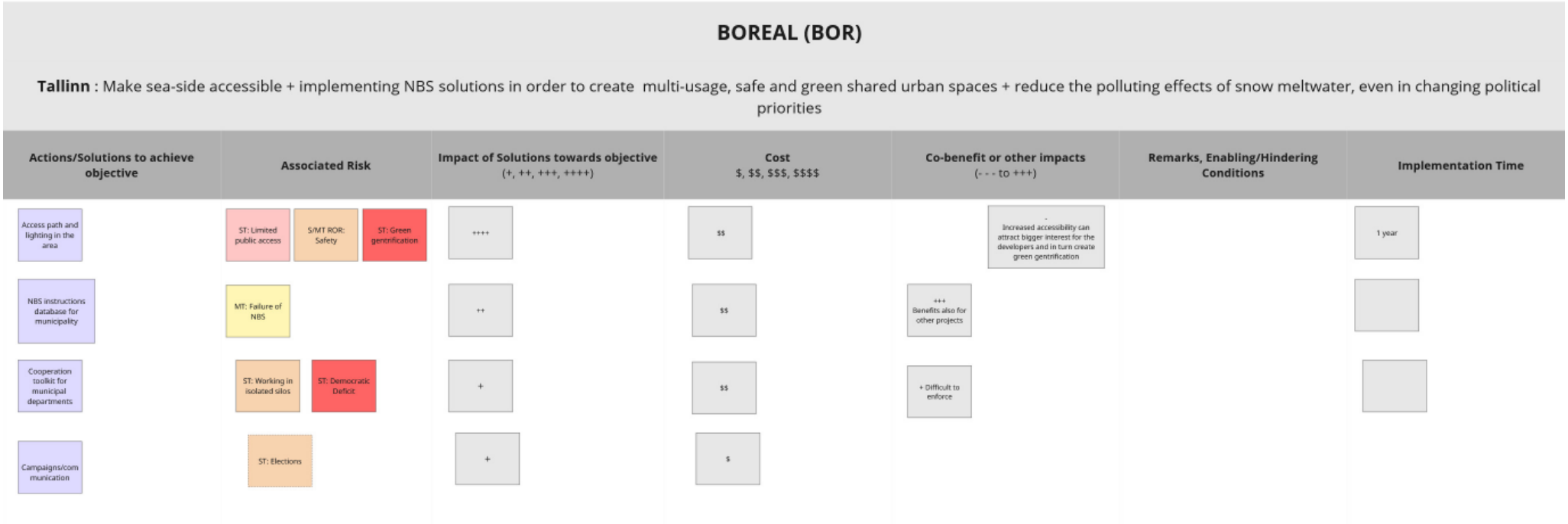


Source: Information gathered from workshop 1

Workshop 2

During this workshop, four main actions were identified. The following risk were not considered: “Coastal Degradation”, “Reduced Inclusivity”, “Property Development”, “Coastal Erosion”, and “Climate Change”.

Figure 51. Tallinn actions identification

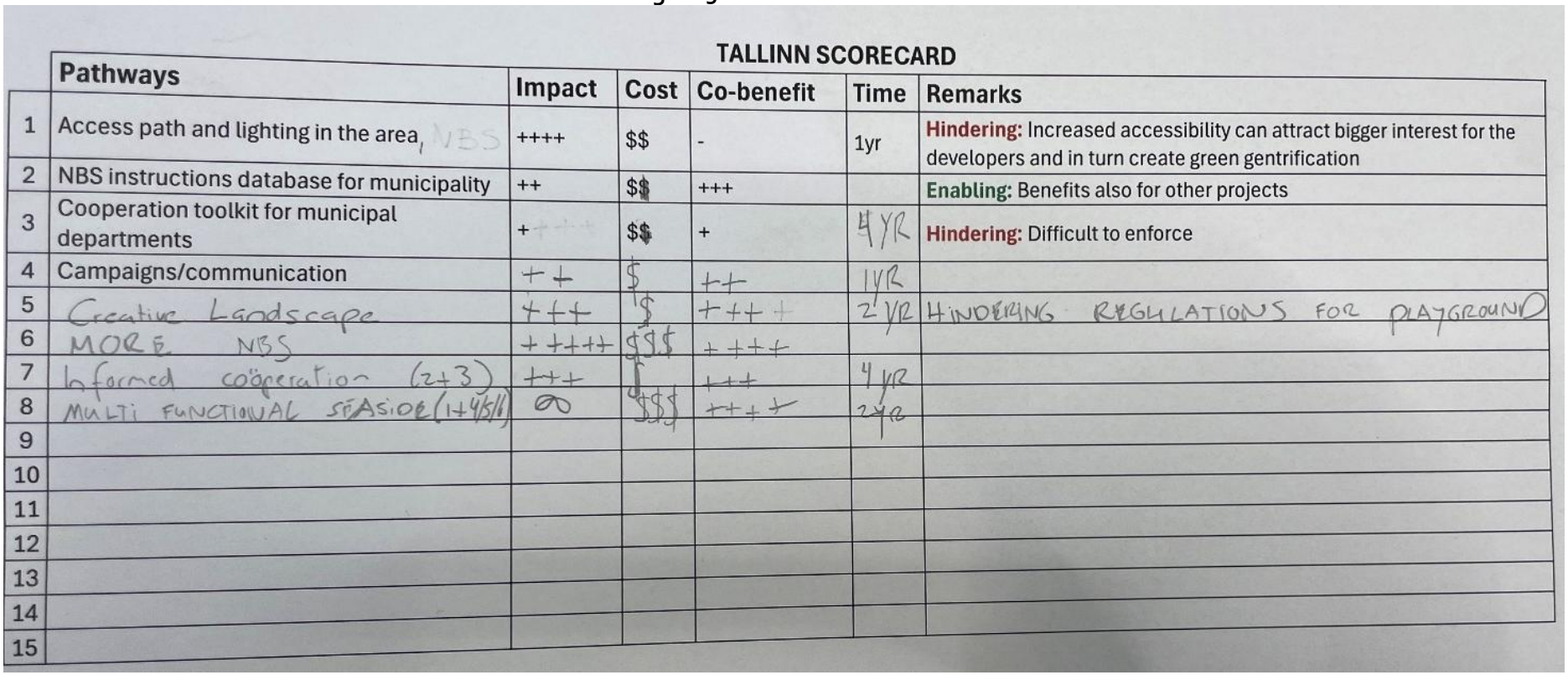


Source: Information gathered from Miro board used for workshop 2

Workshop 3

During this workshop, two additional actions were added: "Creative Landscape" and "More NBS", and two pathways were created. Part of the discussion during this exercise was how if citizens got attached to green spaces implemented, they would want to hold on to them, and detail plans for the area could change from a "car street" to pedestrian.

Figure 52. Tallinn scorecard



TALLINN SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Access path and lighting in the area, NBS	++++	$$	-	1yr	**Hindering:** Increased accessibility can attract bigger interest for the developers and in turn create green gentrification
2	NBS instructions database for municipality	++	$$	+++		**Enabling:** Benefits also for other projects
3	Cooperation toolkit for municipal departments	+	$$	+	4 YR	**Hindering:** Difficult to enforce
4	Campaigns/communication	++	$	++	1YR	
5	Creative Landscape	+++	$	+++	2 YR	HINDERING REGULATIONS FOR PLAYGROUND
6	MORE NBS	+++++	$$$	++++		
7	Informed cooperation (2+3)	+++	$	+++	4 yr	
8	MULTI FUNCTIONAL SEASIDE (1+4/5/6)	∞	$$$	+++	2 yr	
9						
10						
11						
12						
13						
14						
15						

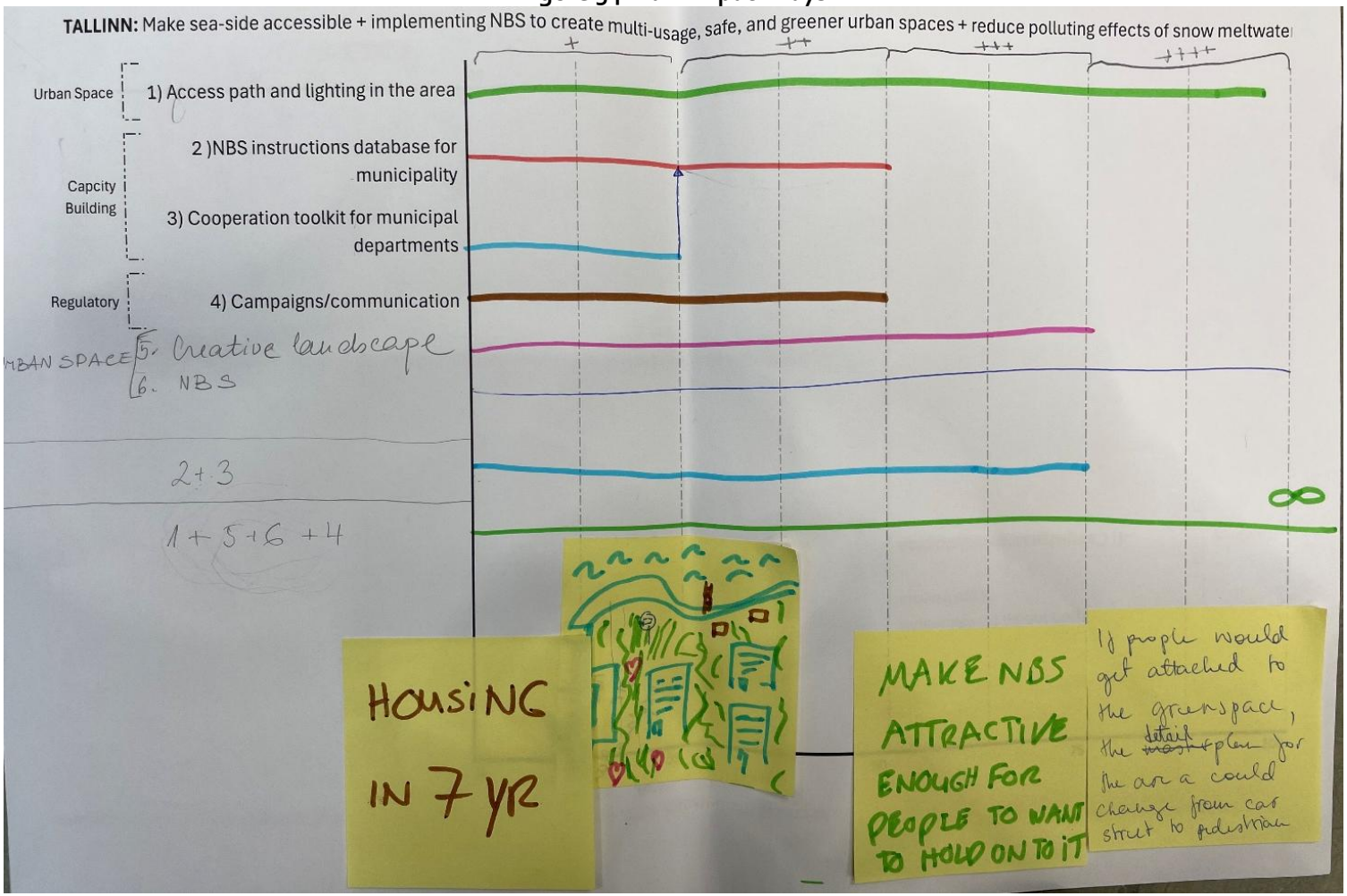
Source: Scorecard filled in during workshop 3

Figure 53. Tallinn digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Access path and lighting in the area	++++	++	-
NBS instructions DB for municipality	++	+	+++
Cooperation toolkit for municipality	+	+	+
Campaigns/communication	++	+	++
Creative landscape	+++	+	+++
NBS	++++	+++	++++
NBS instructions database for municipality + Cooperatin toolkit for municipality	+++	+	+++
Access path and lighting in the area + Creative landscape + NBS + Campaigns/communication	++++	+++	++++

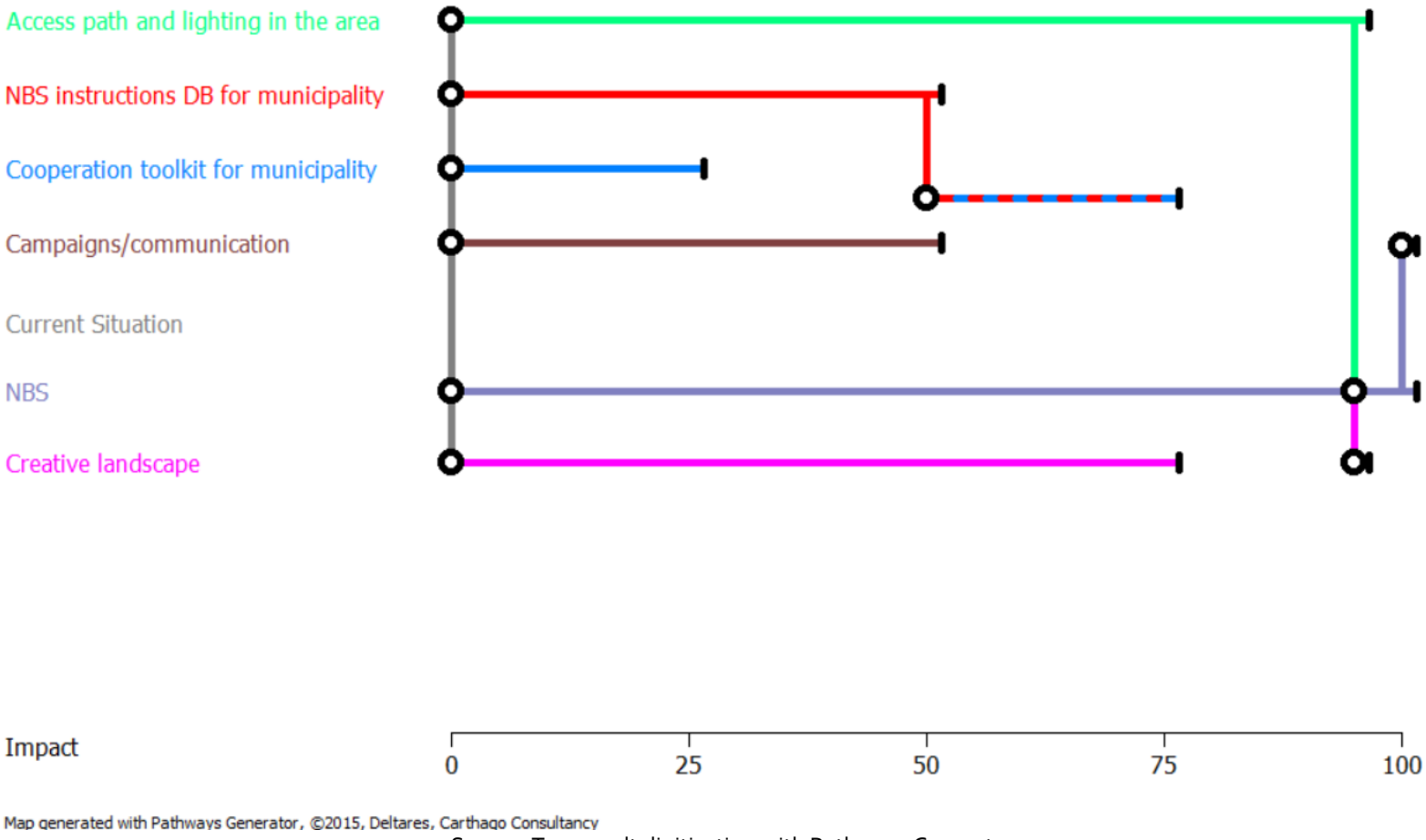
Source: T2.2 result digitisation

Figure 54. Tallinn pathways



Source: Pathways filled in during workshop 3

Figure 55. Tallinn digitised and approved pathways



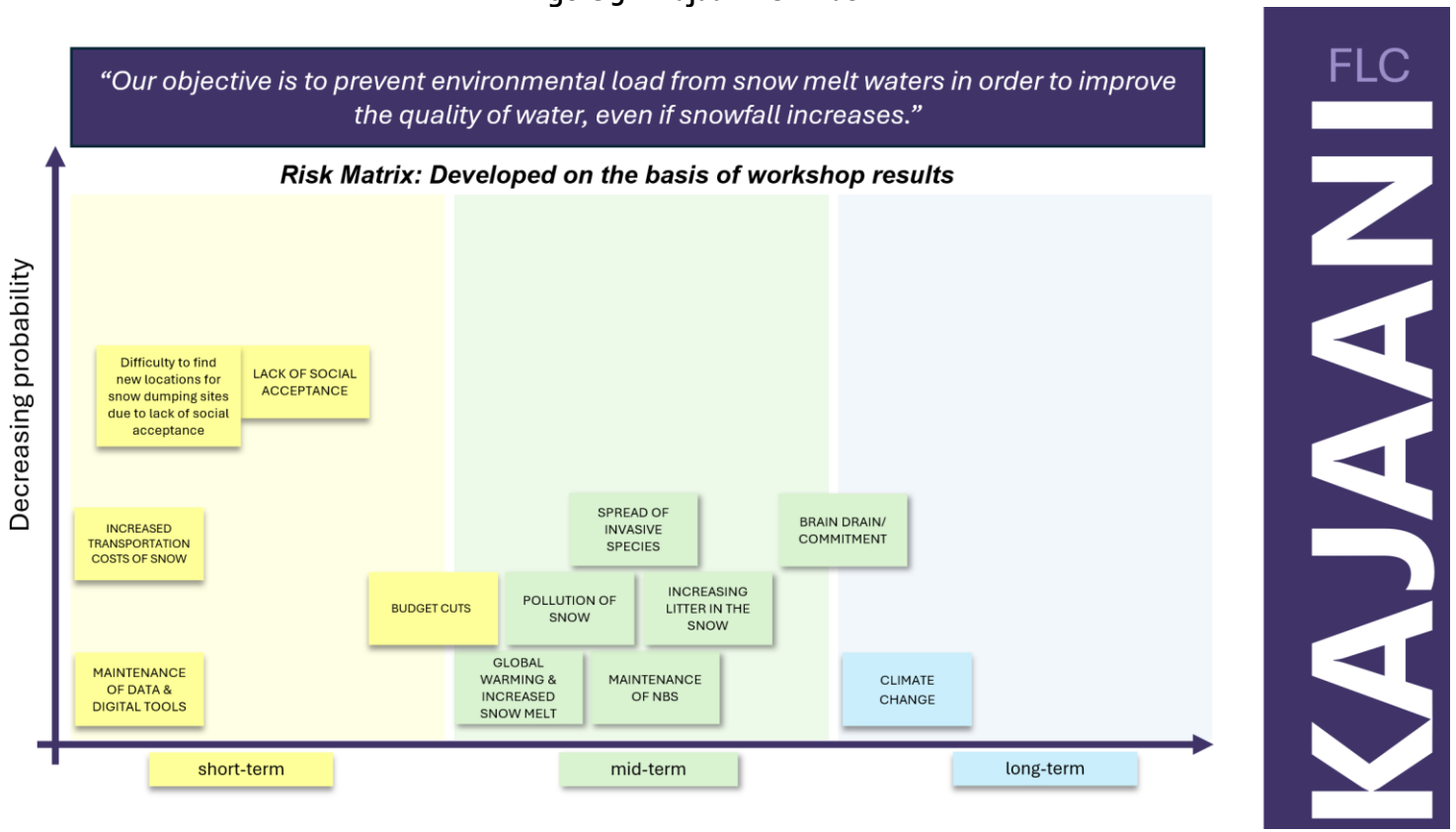
Source: T2.2 result digitisation with Pathways Generator

Kajaani

Workshop 1

Most of the risks identified during this workshop fall under the short and mid-term duration

Figure 56. Kajaani risk matrix

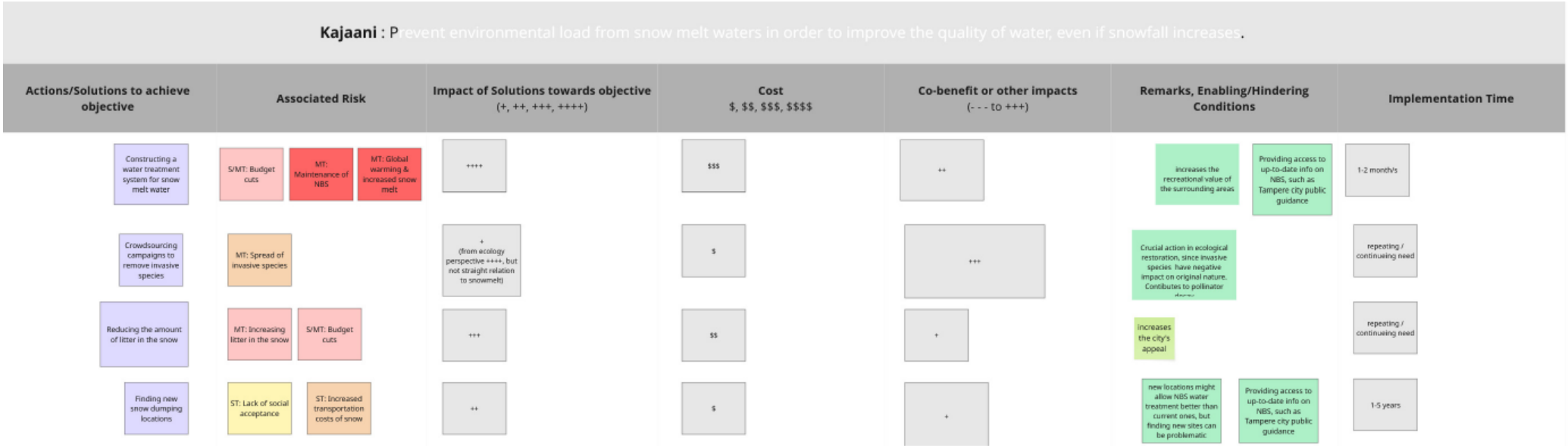


Source: Information gathered from workshop 1

Workshop 2

During this workshop, four main actions were identified. The following previously identified risks were not considered: “Maintenance of data and digital tools”, “Climate change”, “Pollution of snow”, “Brain drain/ Commitment”, “Difficulty to find new locations for snow dumping”.

Figure 57. Kajaani actions identification



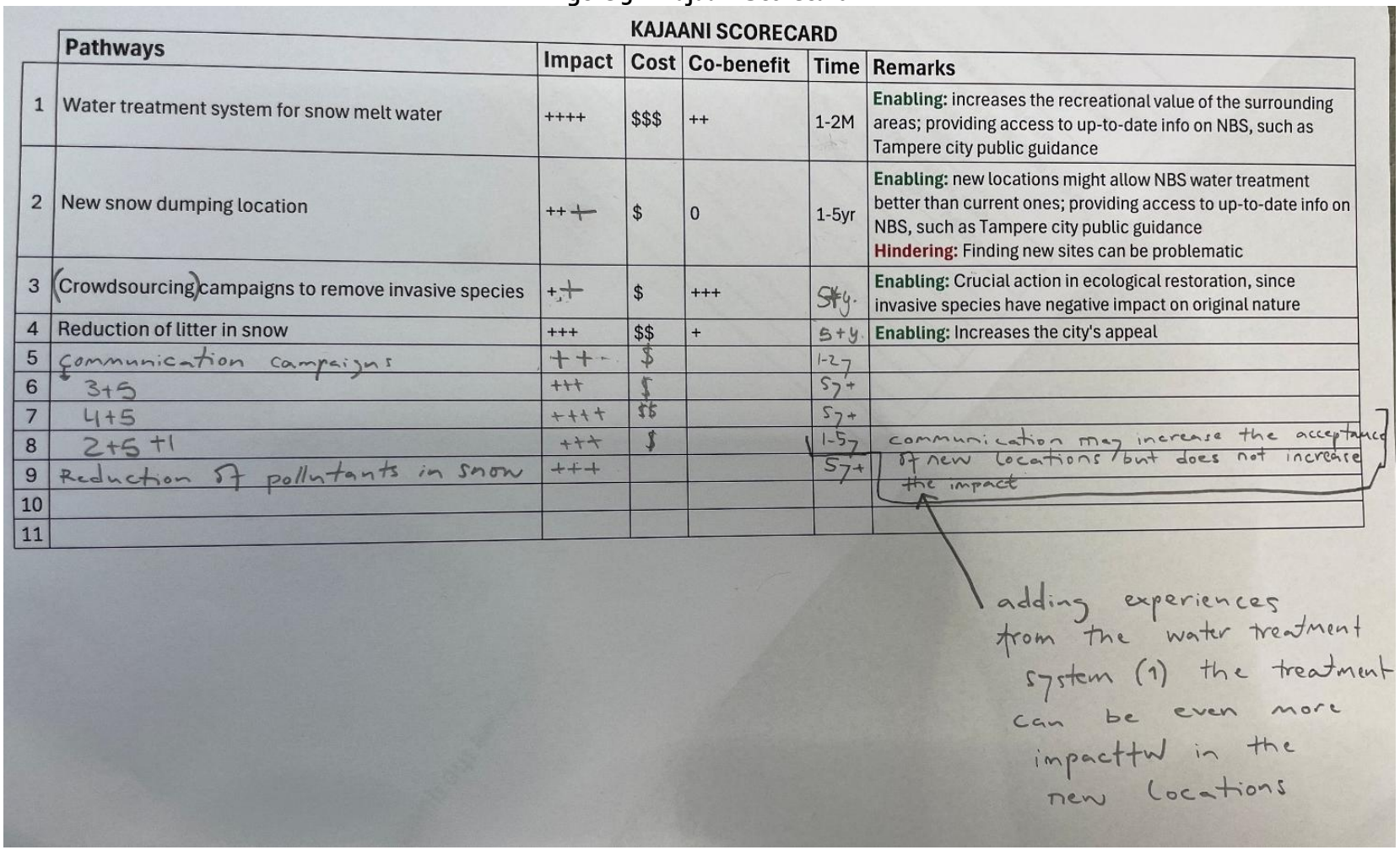
Source: Information gathered from Miro board used for workshop 2

Workshop 3

Two additional actions, “Communication Campaigns” and “Reduction of harmful substances in snow”, were added during this workshop. Additionally, three pathways were created. Discussions centred on the implementation of the selected pathway, mentioned the tasks needed to implement some actions:

- *Water treatment*: Collecting information on how the system actually works → Instructions/guidelines for constructing treatment systems for the new snow dumping locations.
- *New snow dumping location*: Survey/identify potential locations
- *Reduction of litter*: Innovative waste bins introduced
- *Communication campaigns*: participation in larger events, such as Europe Day; organising workshops; social media campaigns.

Figure 58. Kajaani Scorecard



KAJAANI SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Water treatment system for snow melt water	++++	$$$	++	1-2M	**Enabling:** increases the recreational value of the surrounding areas; providing access to up-to-date info on NBS, such as Tampere city public guidance
2	New snow dumping location	++	$	0	1-5yr	**Enabling:** new locations might allow NBS water treatment better than current ones; providing access to up-to-date info on NBS, such as Tampere city public guidance **Hindering:** Finding new sites can be problematic
3	Crowdsourcing campaigns to remove invasive species	+	$	+++	5+y.	**Enabling:** Crucial action in ecological restoration, since invasive species have negative impact on original nature
4	Reduction of litter in snow	+++	$$	+	5+y.	**Enabling:** Increases the city's appeal
5	Communication campaigns	++	$		1-2 7	
6	3+5	+++	$		5 7+	
7	4+5	++++	$$		5 7+	
8	2+5 +1	+++	$		1-5 7	communication may increase the acceptance of new locations but does not increase the impact
9	Reduction of pollutants in snow	+++			5 7+	
10						
11						

adding experiences from the water treatment system (1) the treatment can be even more impacttw in the new locations

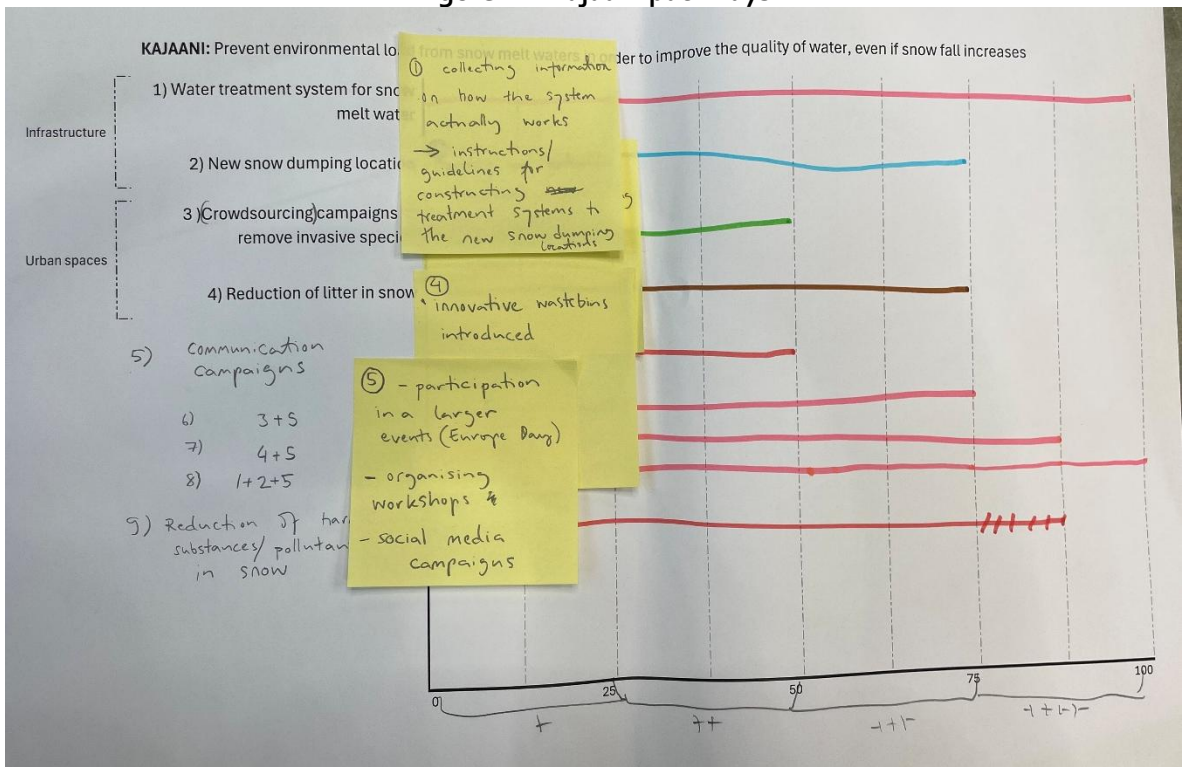
Source: Scorecard filled in during workshop 3

Figure 59. Kajaani digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Current Situation	0	0	0
Water treatment system for snow melt water	++++	+++	++
New snow dumping location	+++	+	0
Campaigns to remove invasive species	++	+	+++
Reduction of litter in snow	+++	++	+
Communication campaigns	++	+	0
Reduction of harmful substances/pollutants in snow	+++	0	0
Campaigns to remove invasive species + Communication campaigns	+++	+	0
Reduction of litter in snow + Communication campaigns	++++	++	0
Water treatment system for snow melt water + New snow dumping location + Communication campaigns	+++	+	0

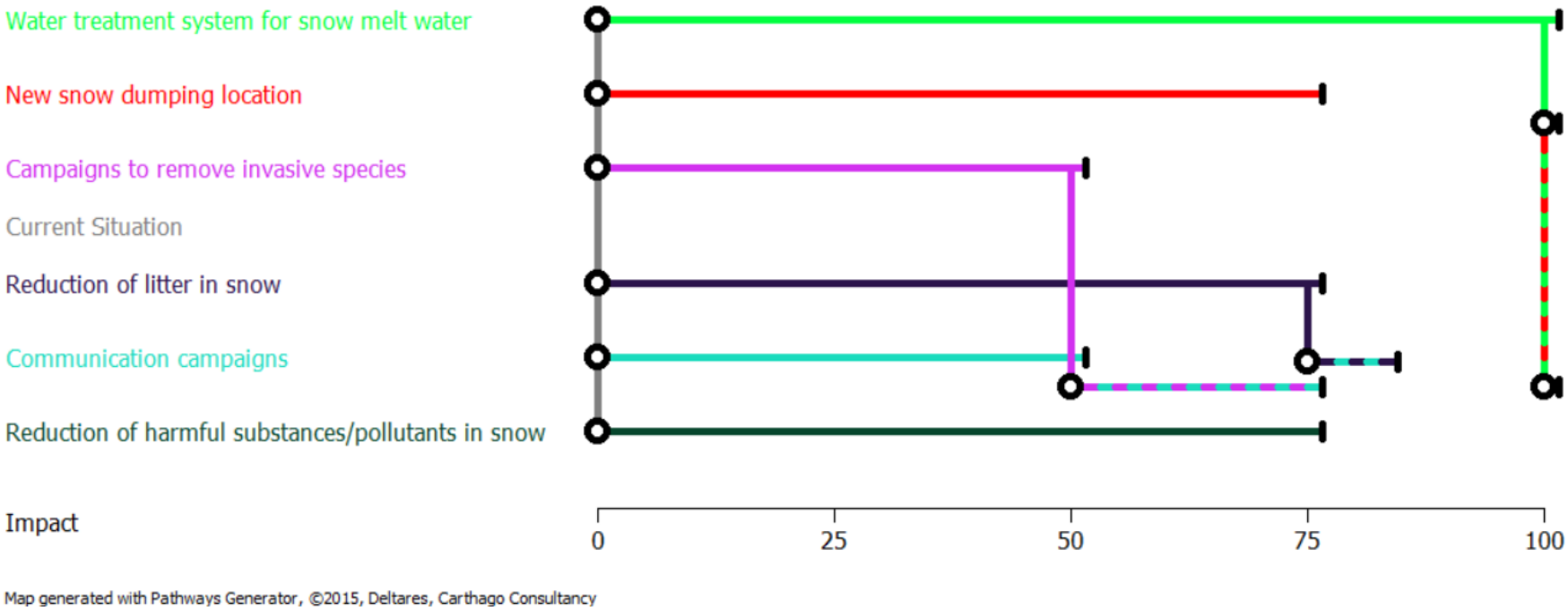
Source: T2.2 result digitisation

Figure 60. Kajaani pathways



Source: Pathways filled in during workshop 3

Figure 61. Kajaani digitised and approved pathways



Source: T2.2 result digitisation with Pathways Generator

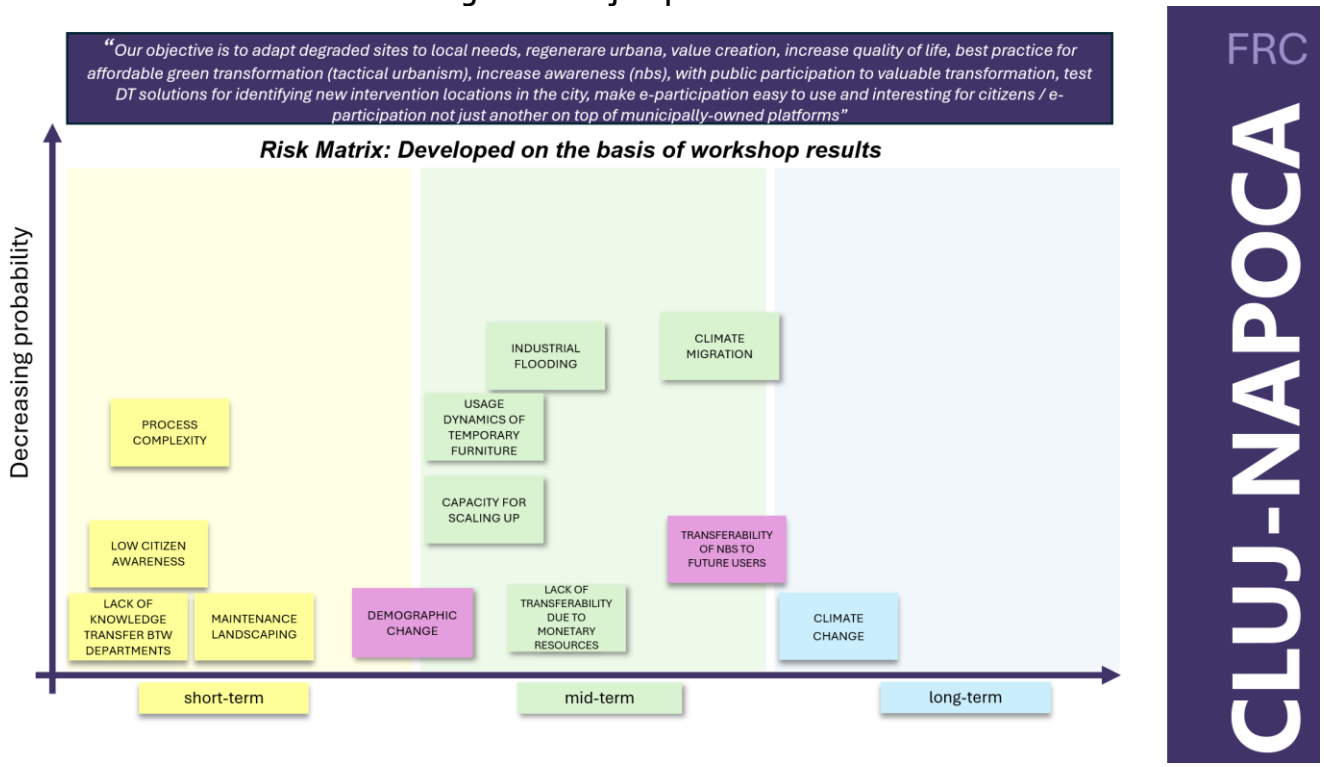
Continental Climatic Zone

Cluj-Napoca

Workshop 1

During this workshop, two recurrent risks were identified: "Demographic Change" and "Transferability of NBS to future users".

Figure 62. Cluj-Napoca risk matrix



Source: Information gathered from workshop 1

Workshop 2

Eight different actions were identified during this workshop, which were categorized in three different groups by the city: “Ecosystem, not ego-system”, “Awareness, communication, and outreach”, and “Monitoring”. From the previously defined risks, “Lack of transferability due to monetary resources” and “Low citizen awareness” were not considered.

Figure 63. Cluj-Napoca actions identification

CONTINENTAL (CONT)

Cluj - Napoca : Objective — CLUJ-NAPOCA OBJECTIVE: adapt degraded sites to local needs, regenerare urbana, value creation, increase quality of life, best practice for affordable green transformation (tactical urbanism), increase awareness (nbs), with public participation to valuable transformation, test digital twin solution for identifying new intervention locations in the city
make e-participation easy to use and interesting for citizens / e-participation not just another on top of municipality-owned platforms

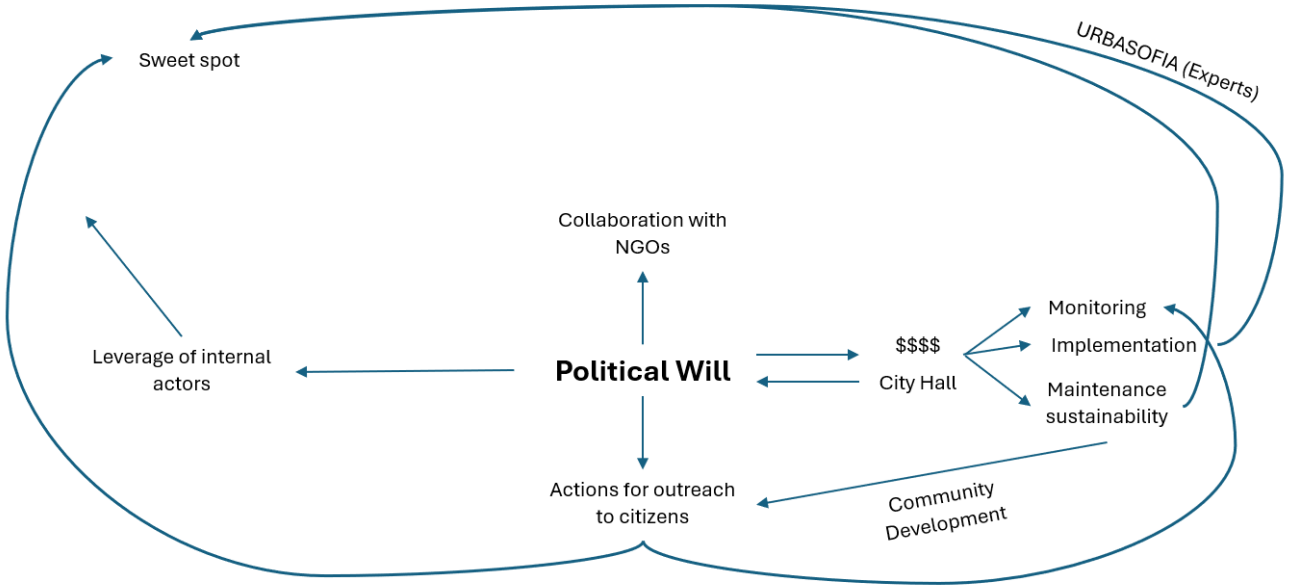
	Actions/Solutions to achieve objective	Associated Risk	Impact of Solutions towards objective (+, ++, +++, ++++)	Cost $, $$, $$$, $$$$	Co-benefit or other impacts (- - - to +++)	Remarks, Enabling/Hindering Conditions	Implementation Time
“Ecosystem, not ego-system”	Strengthen cooperation with green spaces department	ST: Maintenance landscaping; ST: Lack of knowledge transfer bew departments; MT: Capacity for scaling up	++++	$$$	++	Available budget of Green Spaces Department + current inventory of plants. Hindering conditions: Cluj town has 60K total remaining for planting, urban furniture, services, etc..	Next 6 months
	Better involvement of local NGOs in: temporary interventions/actions, citizen engagement, communication actions	MT ROR: Transferability of NBS to future users; MT: Capacity for scaling up; MT: Improper usage of temporary furniture	++	$$$	+	Enabling: already good connections with NGOs. Hindering: Different agendas and conflict of interests	Next 6 months
	New collaborations with local actors for biodiversity related actions: pollinators studies, hotel de insecte, bird biodiversity, birds nests/shelters	ST: unpredictibility of impact on biodiversity	+++	$	++	Enabling: already good connections with USAMV. Hindering: potential hard work without renumeration	Next 12 months
	Leverage on external actors (starting from existing models - e.g. Adopt a Green Space) that can help with: investment, management, long term use.	ST: Low budget for extensive planting for the pilot sites - impact might be reduced for 2-3 years until vegetation grows; MT: Capacity for scaling up	+	$	+++	Enabling: existing procedures. Hindering: Restrictive financial context. No more “hand-outs”	2 years from now
Awareness, communication, and outreach	Actions for outreach to citizens: dissemination campains, events in the community.	ST: Low engagement with in-situ activites, communication actions, temporary activities/interventions; S/MT ROR: Demographic change; MT ROR: Transferability of NBS to future users	++++	$$	++	Hindering: Lack of trust. Unrealistic expectations. Partipation fatiguel	Next 6 months
	Implement educative and creative info panels (insitu). Part of communication and raising awareness actions	MT: Improper usage of temporary furniture; ST: poor understanding of conceptual terms and linguistic understanding of NBS and related solutions	++++	$	+	Enabling: you can count on youth - youth participation on long term	Next 12 months
	Capacity building with citizens to understand the NBS use and management	MT: Need of “transferability” due to monetary resources; MT ROR: Transferability of NBS to future users; MT: Improper usage of temporary furniture; LT: Climate change; ST: Process complexity	++++	$	++	Enabling: qualified professionals. Hindering: lack of trust, miss alignment of expectations.	Next 12 months
Monitoring	Monitoring of the interventions success. Step 1 Observations: recuring site visits to see the grade of usage and potential degradation factors Step 2 Keen an eye on KPIs: citizen perception, degree of loneliness, wellbeing	S/MT ROR: Demographic change; MT ROR: Transferability of NBS to future users; ST: meteorological conditions that can affect the planing session	++++	$	+++	Enabling: qualified professionals. Hindering: low-level of repetitive/iterative involvement of citizens (e.g “Another survey!?!?”)	6 months from now - continuous for min. 3 years

Source: Information gathered from Miro board used for workshop 2

Workshop 3

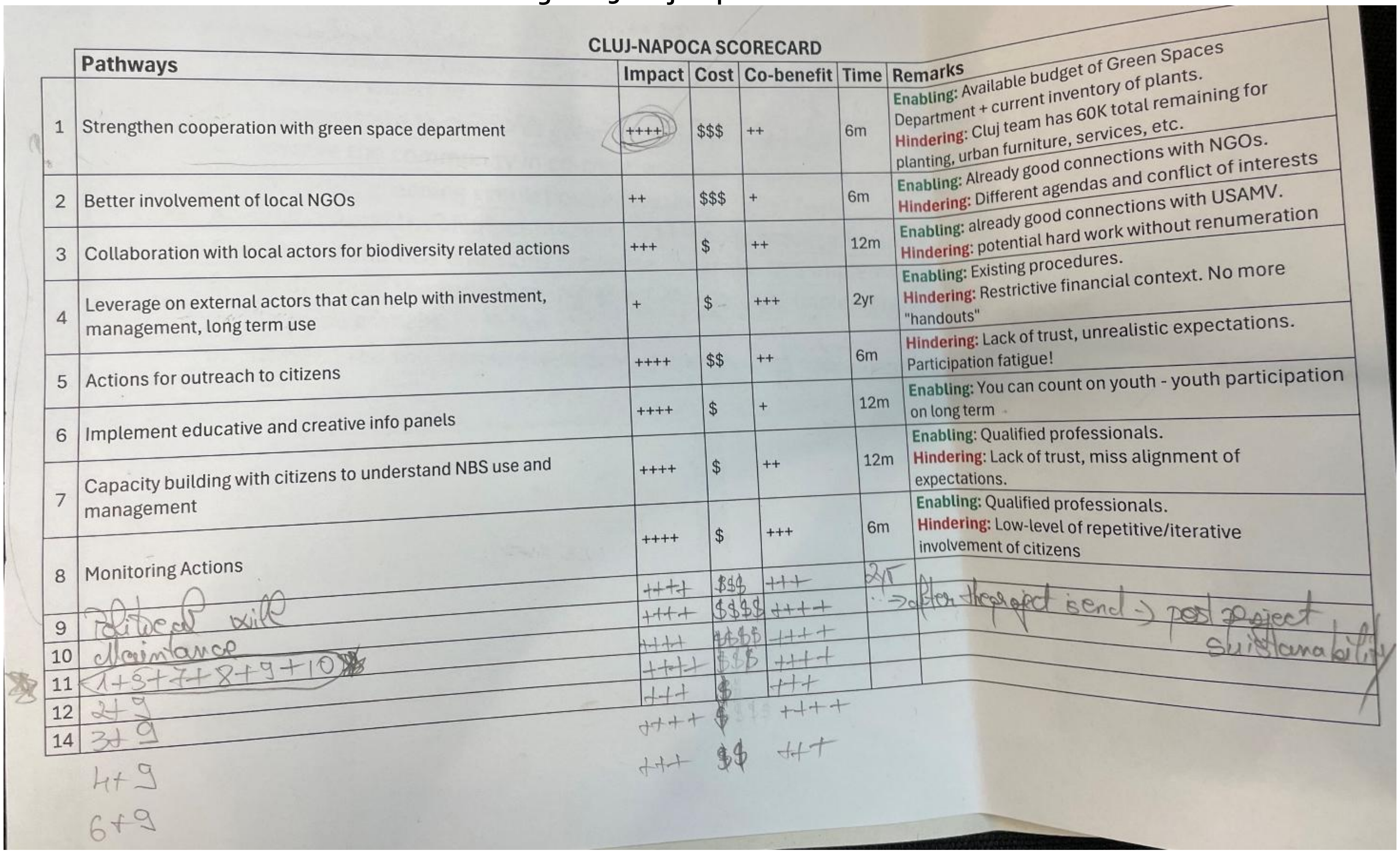
Two additional actions were added as actions "Maintenance" and "Political Will", and four pathways were created. Discussion centred on how the political will strengthens every other action and why it should be in the centre of the actions taken, as shown in the diagram below.

Figure 64. Political Will relation diagram



Source: Cluj-Napoca input from workshop 3

Figure 65. Cluj-Napoca scorecard



CLUJ-NAPOCA SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Strengthen cooperation with green space department	++++	$$$	++	6m	**Enabling:** Available budget of Green Spaces Department + current inventory of plants. **Hindering:** Cluj team has 60K total remaining for planting, urban furniture, services, etc.
2	Better involvement of local NGOs	++	$$$	+	6m	**Enabling:** Already good connections with NGOs. **Hindering:** Different agendas and conflict of interests
3	Collaboration with local actors for biodiversity related actions	+++	$	++	12m	**Enabling:** already good connections with USAMV. **Hindering:** potential hard work without renumeration
4	Leverage on external actors that can help with investment, management, long term use	+	$	+++	2yr	**Enabling:** Existing procedures. **Hindering:** Restrictive financial context. No more "handouts"
5	Actions for outreach to citizens	++++	$$	++	6m	**Hindering:** Lack of trust, unrealistic expectations. Participation fatigue!
6	Implement educative and creative info panels	++++	$	+	12m	**Enabling:** You can count on youth - youth participation on long term
7	Capacity building with citizens to understand NBS use and management	++++	$	++	12m	**Enabling:** Qualified professionals. **Hindering:** Lack of trust, miss alignment of expectations.
8	Monitoring Actions	++++	$	+++	6m	**Enabling:** Qualified professionals. **Hindering:** Low-level of repetitive/iterative involvement of citizens
		++++	$$$	+++	2yr	after the project is end -> post project sustainability
9	Pilot ...	++++	$$$$	++++		
10	Maintenance	++++	$$$$	++++		
11	1+5+7+8+9+10	++++	$$$	++++		
12	2+9	+++	$	+++		
14	3+9	++++	$	++++		
	4+9	+++	$$	+++		
	6+9					

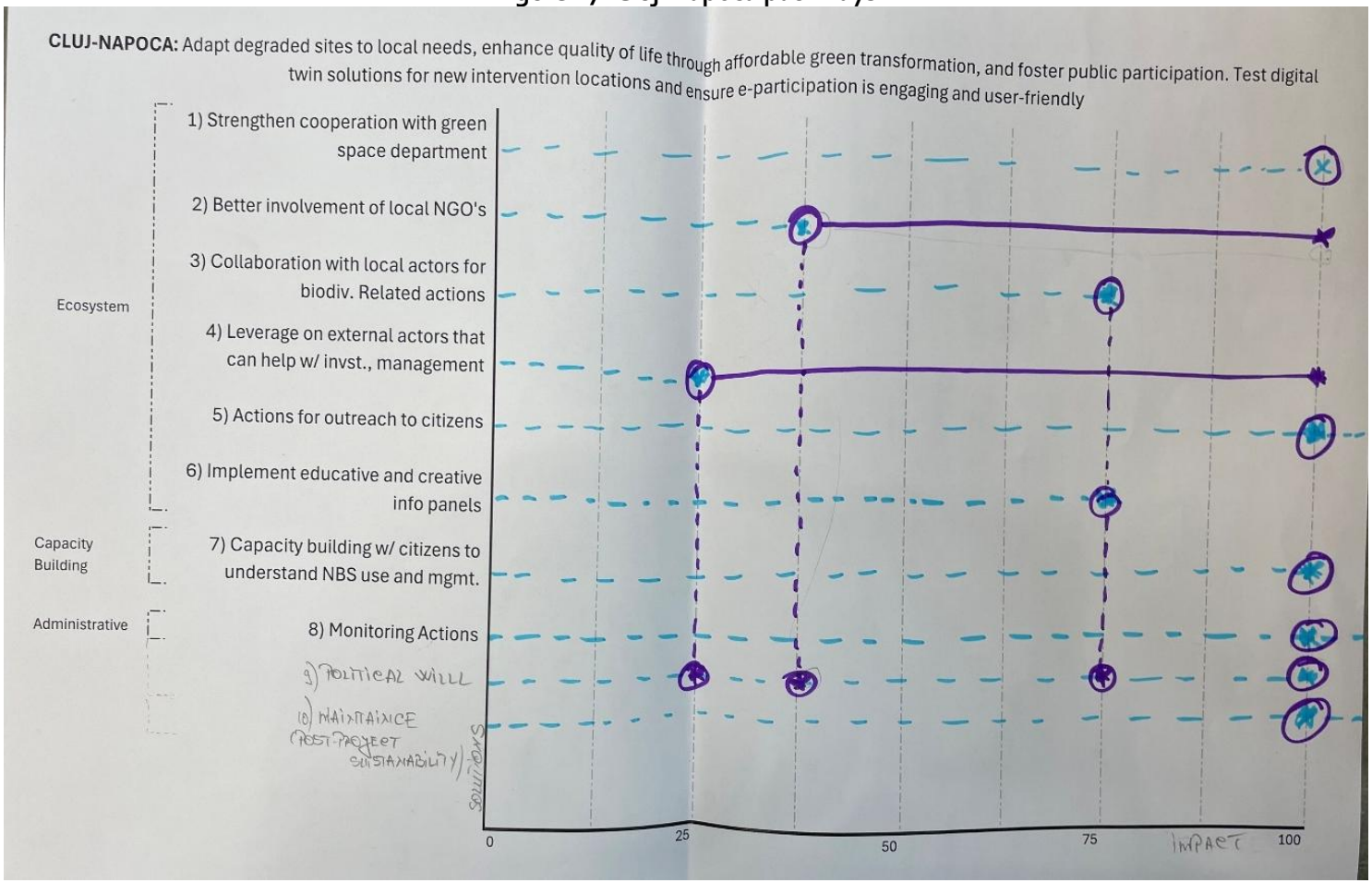
Source: Scorecard filled during workshop 3

Figure 66. Cluj-Napoca digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Current Situation	0	0	0
Strengthen Coop.w/ green space dept.	++++	+++	++
Better involvement of local NGOs	++	+++	+
Collab. w/local actors for biodiv. related actions	+++	+	++
Leverage on ext.actors	+	+	+++
Actions for outreach to citizens	++++	++	++
Educative & creative info. panels	++++	+	+
Capacity building w/citizens	++++	+	++
Monitoring Actions	++++	+	+++
Political will	++++	+++	+++
Maintenance post project	++++	++++	++++
Collab. w/local actors for biodiv. related actions + Maintenance post project + Political will + Monitoring Actions + Capacity building w/citizens + Strengthen Coop.w/ green space dept.	++++	++++	++++
Better involvement of local NGOs + Political will	++++	+++	++++
Collab. w/local actors for biodiv. related actions + Political will	+++	+	+++
Leverage on ext.actors + Political will	++++	+	++++
Educative & creative info. panels + Political will	+++	++	++++

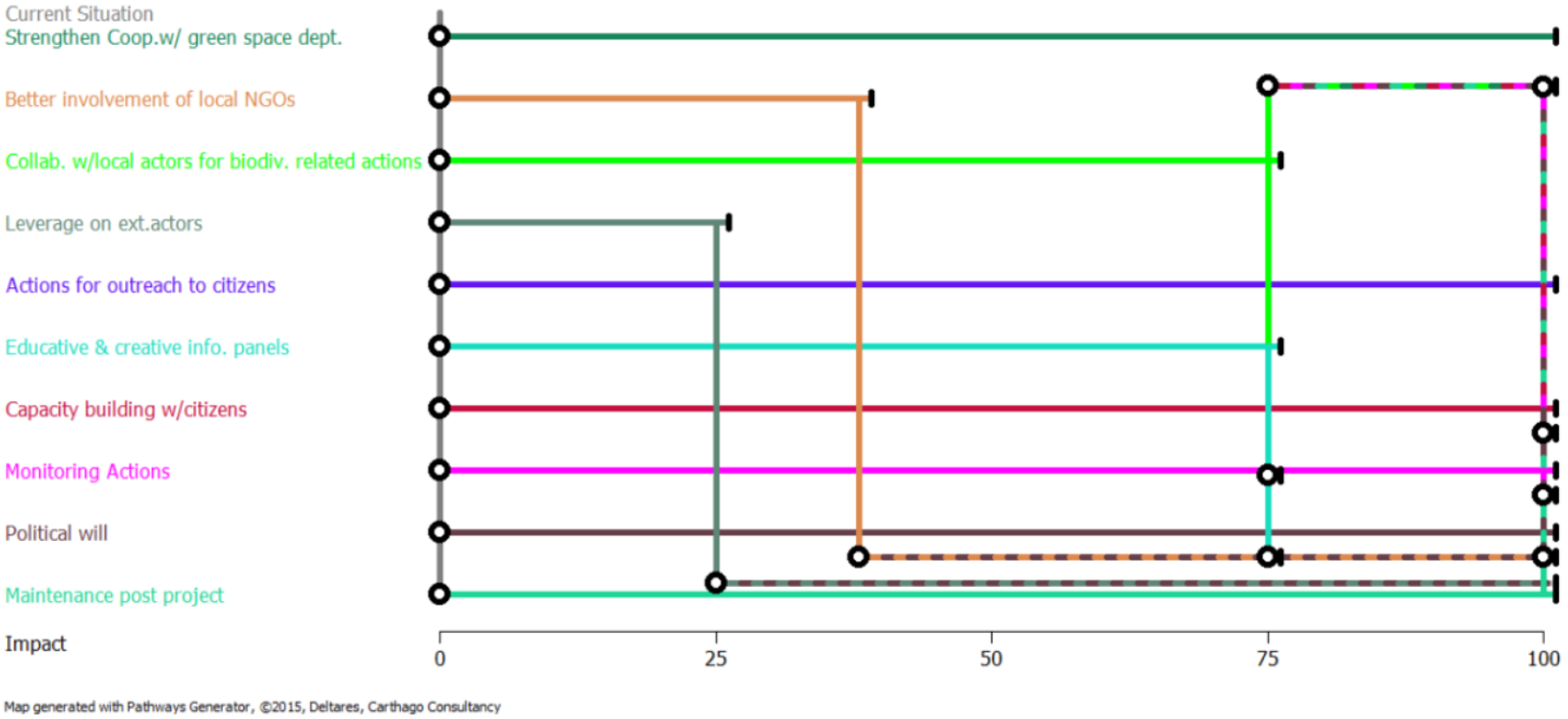
Source: T2.2 result digitisation

Figure 67. Cluj-Napoca pathways



Source: Pathways filled in during workshop 3

Figure 68. Cluj-Napoca digitised and approved pathways



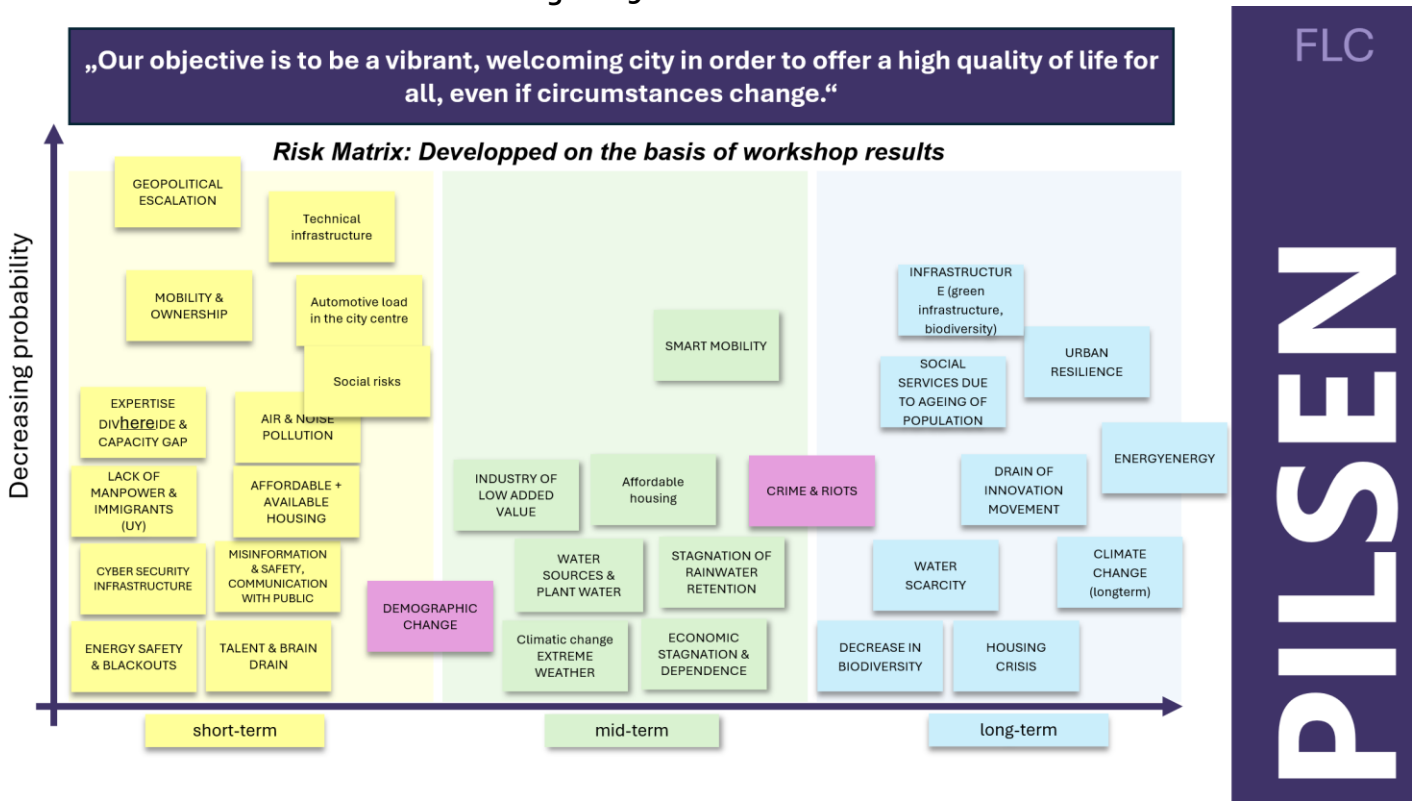
Source: T2.2 digitisation with Pathways Generator

Pilsen

Workshop 1

During this workshop, two recurring risks were identified, “Demographic change” and “Crime and Riot”. Additionally, most of the risks mapped are in the short-term category

Figure 69. Pilsen risk matrix



Source: Information gathered from workshop 1

Workshop 2

Four different actions were identified during the workshop, tackling high probability risks.

Figure 70. Pilsen actions identification

Pilsen : To be a vibrant, welcoming city in order to offer a high quality of life for all, even if circumstances change.

Actions/Solutions to achieve objective	Associated Risk	Impact of Solutions towards objective (+, ++, +++, ++++)	Cost $, $$, $$$, $$$$	Co-benefit or other impacts (- - - to +++)	Remarks, Enabling/Hindering Conditions	Implementation Time
Energy safety + blackouts PVE (municipal buildings) ecosystem = companies water savings EUREKA SPARROW -> EU Projects	ST: Energy safety & blackouts; ST: Social Risk; LT: Energy	++	$	+	Can be enriching for the city, and cities can learn from them	3-4 years
Water Savings PlantControl (smart irrigation + Nextdrop (water leaks)	MT: Water sources and plant water; LT: Energy; LT: Urban resilience; LT: Water scarcity	++++	$$	+++	Savings on waste of water	
Places dedicated to be in the wild. Plant of blooming flowers	LT: Decrease in biodiversity; LT: Climate change	++	$	+	Educating the pop. and awareness	1 year
PINE Pilsen Innovation Ecosystem	ST: Talent & brain drain; LT: Drain of innovation movement; ST: Lack of manpower & immigrants (UY)	++	$$$	+++		Longterm

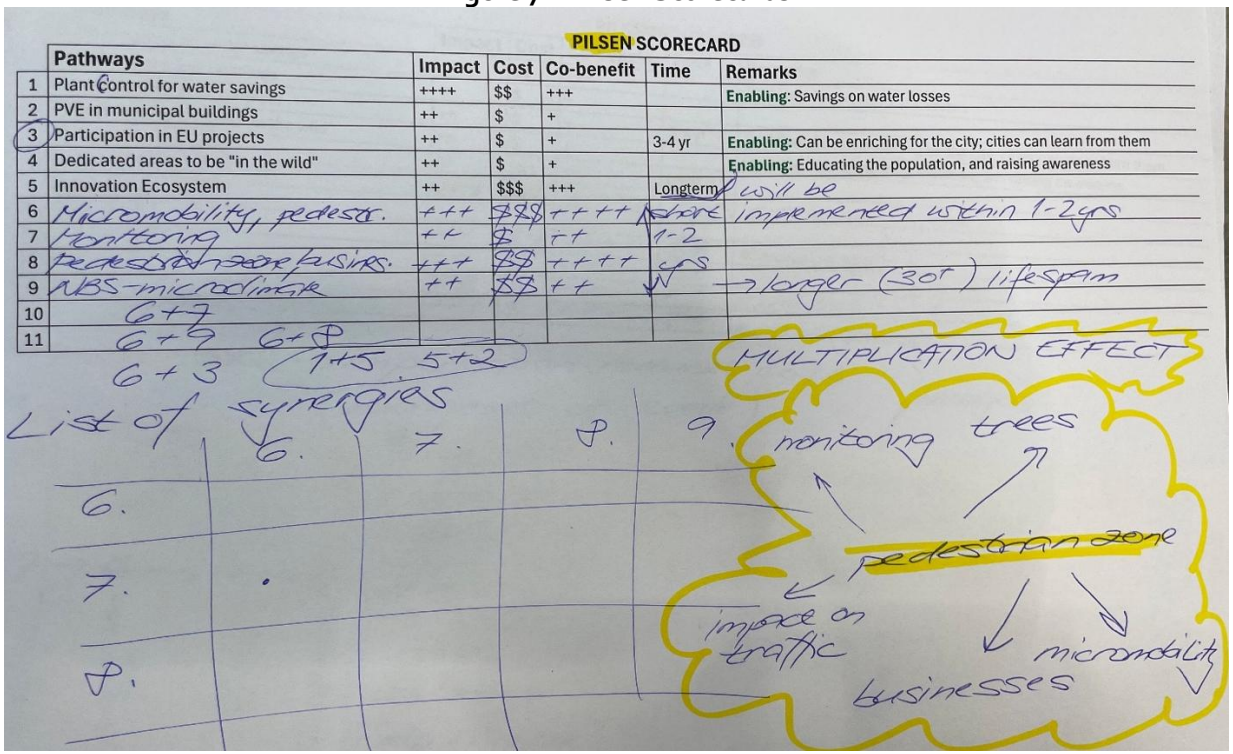
Source: Information gathered from Miro board used for workshop 2

Workshop 3

Of the original four actions, the first was split into two: “Plant Control for Water Savings” and “PVE in Municipal Buildings.” These five actions were classified as urban-level initiatives. In addition, four site-specific actions related to the NBS site were added. Discussion focused on the potential multiplier effects of certain solutions, such as pedestrian zones, and on how economies of scale can reduce implementation costs.

For the selected pathway, the proposed sequence is: establish a monitored baseline; implement micromobility measures with an emphasis on pedestrian zones; introduce NBS microclimate interventions, particularly tree planting; and finally, expand pedestrian zones to support businesses.

Figure 71. Pilsen Scorecards



PILSEN SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Plant control for water savings	++++	$$	+++		**Enabling:** Savings on water losses
2	PVE in municipal buildings	++	$	+		
3	Participation in EU projects	++	$	+	3-4 yr	**Enabling:** Can be enriching for the city; cities can learn from them
4	Dedicated areas to be "in the wild"	++	$	+		**Enabling:** Educating the population, and raising awareness
5	Innovation Ecosystem	++	$$$	+++	Longterm	
6	Micromobility, pedestr.	+++	$$$	++++	before	will be implemented within 1-2yrs
7	Monitoring	++	$	++	1-2	
8	pedestrian zone/ businesses	+++	$$	++++	yrs	
9	NBS-microclimate	++	$$	++		→ longer (30+) lifespan
10	6+7					
11	6+9 6+8					

6+3 1+5 5+2

List of synergies

6. 7. 8. 9.

6.

7.

8.

MULTIPLICATION EFFECT

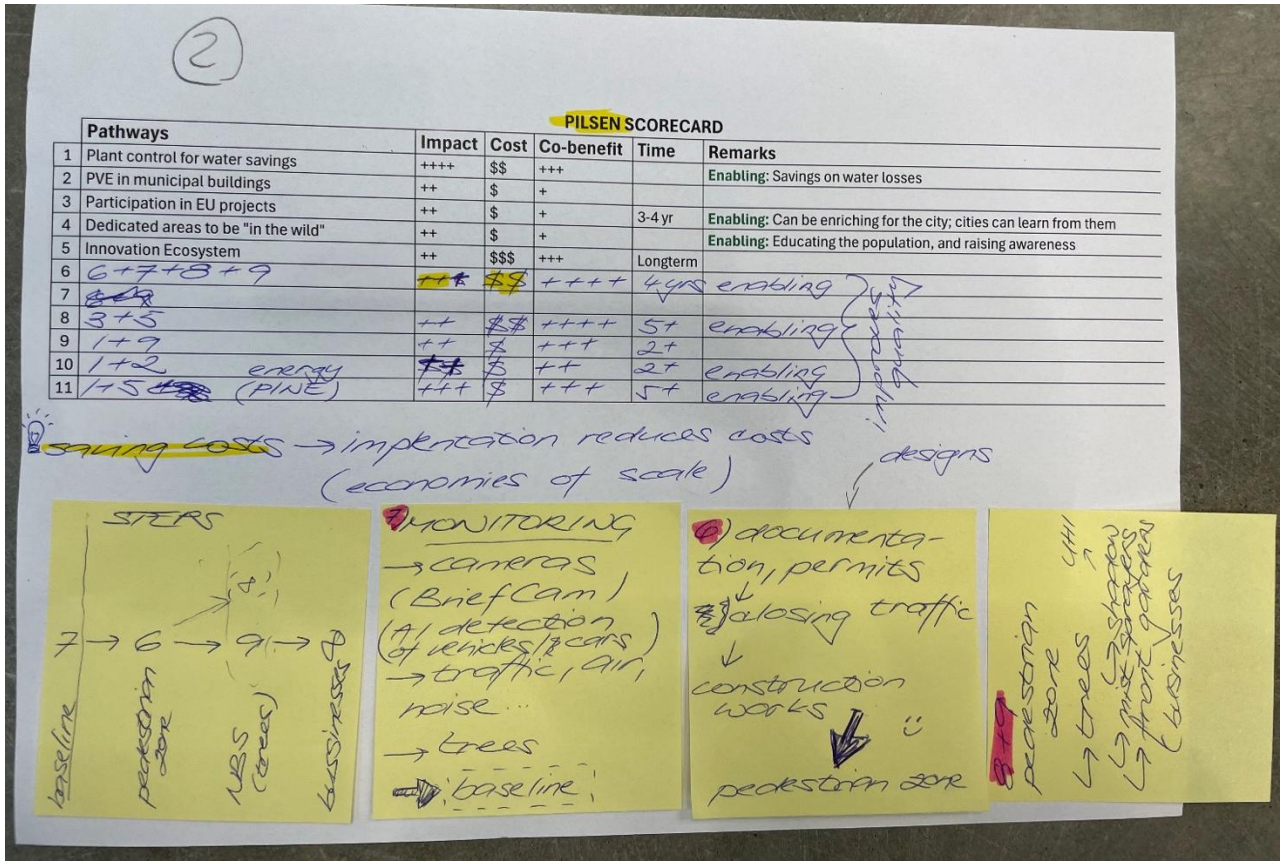
monitoring trees

pedestrian zone

impact on traffic

microclimate

businesses



PILSEN SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Plant control for water savings	++++	$$	+++		**Enabling:** Savings on water losses
2	PVE in municipal buildings	++	$	+		
3	Participation in EU projects	++	$	+	3-4 yr	**Enabling:** Can be enriching for the city; cities can learn from them
4	Dedicated areas to be "in the wild"	++	$	+		**Enabling:** Educating the population, and raising awareness
5	Innovation Ecosystem	++	$$$	+++	Longterm	
6	6+7+8+9	++++	$$	++++	4yrs	enabling
7						
8	3+5	++	$$	++++	5+	enabling
9	1+9	++	$	+++	2+	
10	1+2	+	$	++	2+	enabling
11	1+5 (PINE) energy	+++	$	+++	5+	enabling

saving costs → implentation reduces costs (economies of scale)

designs

improves attractivity

STEPS

7 → 6 → 9 → 8

baseline, pedestrian zone, NBS (trees), businesses

MONITORING
→ cameras (BriefCam)
(AI detection of vehicles/cars)
→ traffic, air, noise...
→ trees
→ baseline

6) documentation, permits
→ closing traffic
→ construction works
→ pedestrian zone

pedestrian zone
↳ trees
↳ investigation
↳ thermal comfort
(businesses)

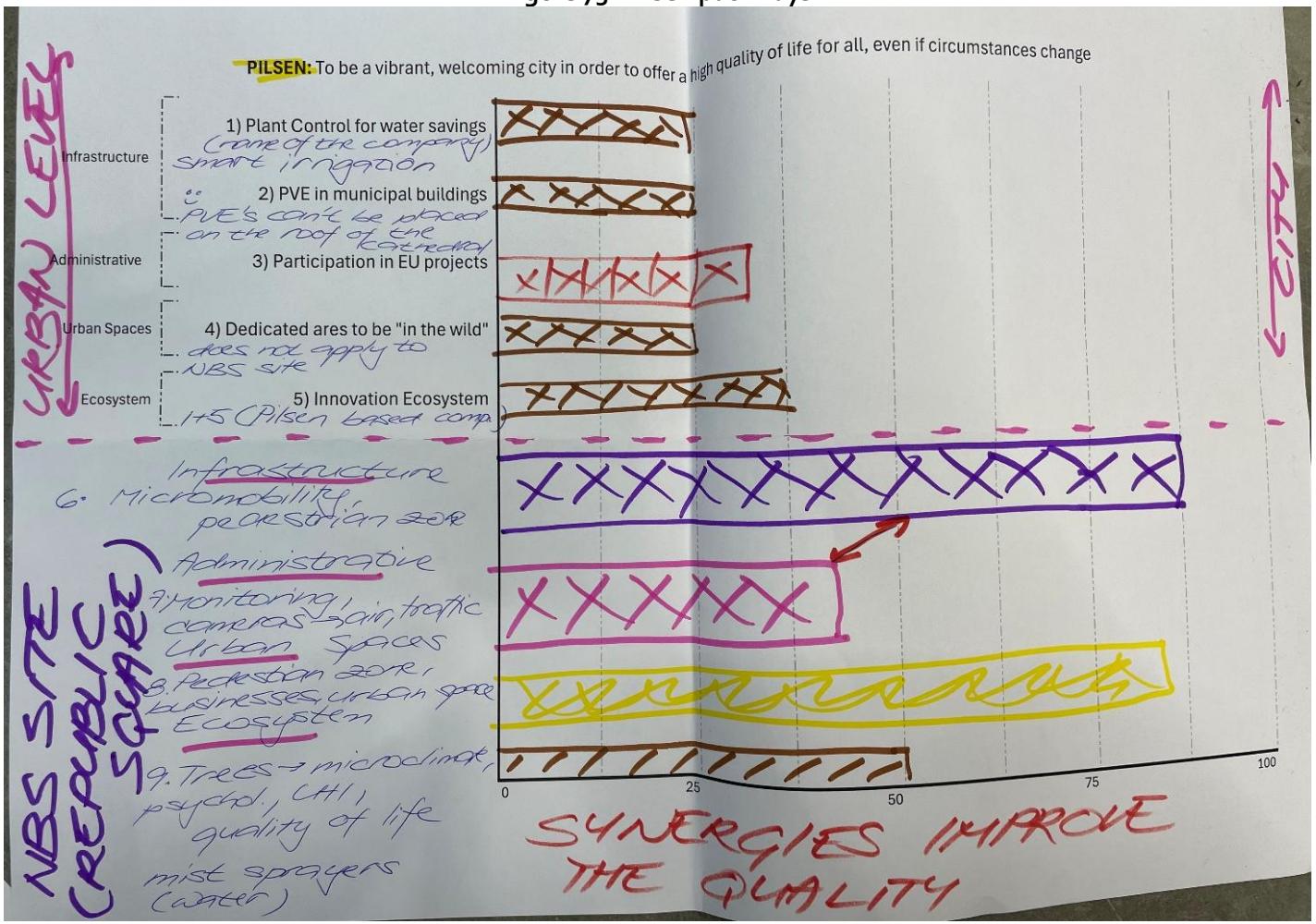
Source: Scorecards filled in during workshop

Figure 72. Pilsen digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Current Situation	0	0	0
Plant Control for water savings	+	++	+++
PVE in municipal buildings	+	+	+
Participation in EU projets	++	+	+
Dedicated areas to be "in the wild"	+	+	+
Innovation Ecosystem	++	+++	+++
Micromobility, pedestrian	++++	+++	++++
Monitoring	++	+	++
Pedestrian zone	++++	++	++++
Microclimate Trees	++	++	++
Participation in EU projets + Innovation Ecosystem	++	++	++++
Plant Control for water savings + Microclimate Trees	++	+	+++
Plant Control for water savings + PVE in municipal buildings	++	+	++
Plant Control for water savings + Innovation Ecosystem	+++	+	+++
Monitoring + Microclimate Trees + Pedestrian zone + Micromobility, pedestrian	++++	++	++++

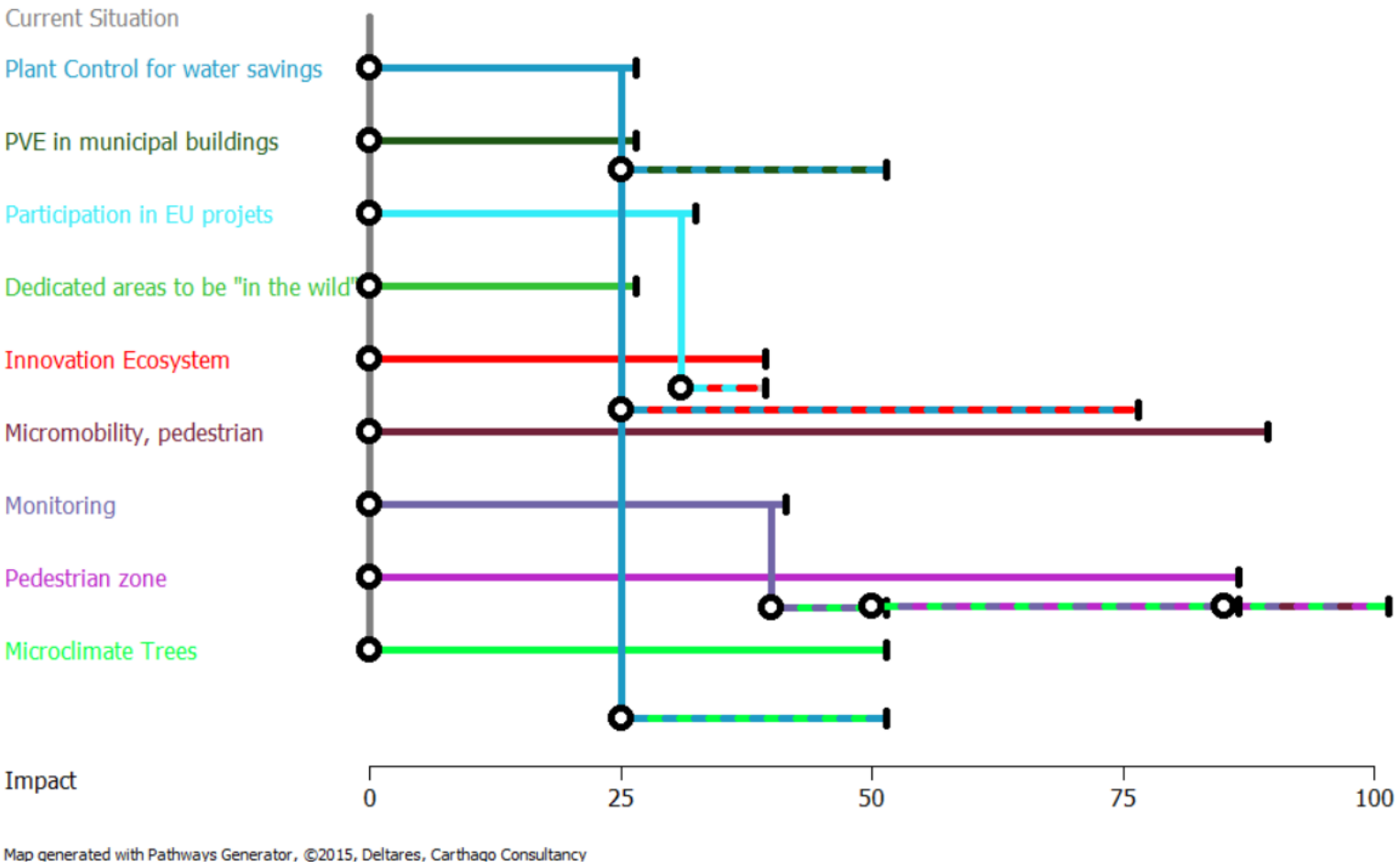
Source: T2.2 result digitisation

Figure 73. Pilsen pathways



Source: Pathways filled in during workshop 3

Figure 74. Pilsen digitised and approved pathways



Source: T2.2 result digitisation with Pathway Generator

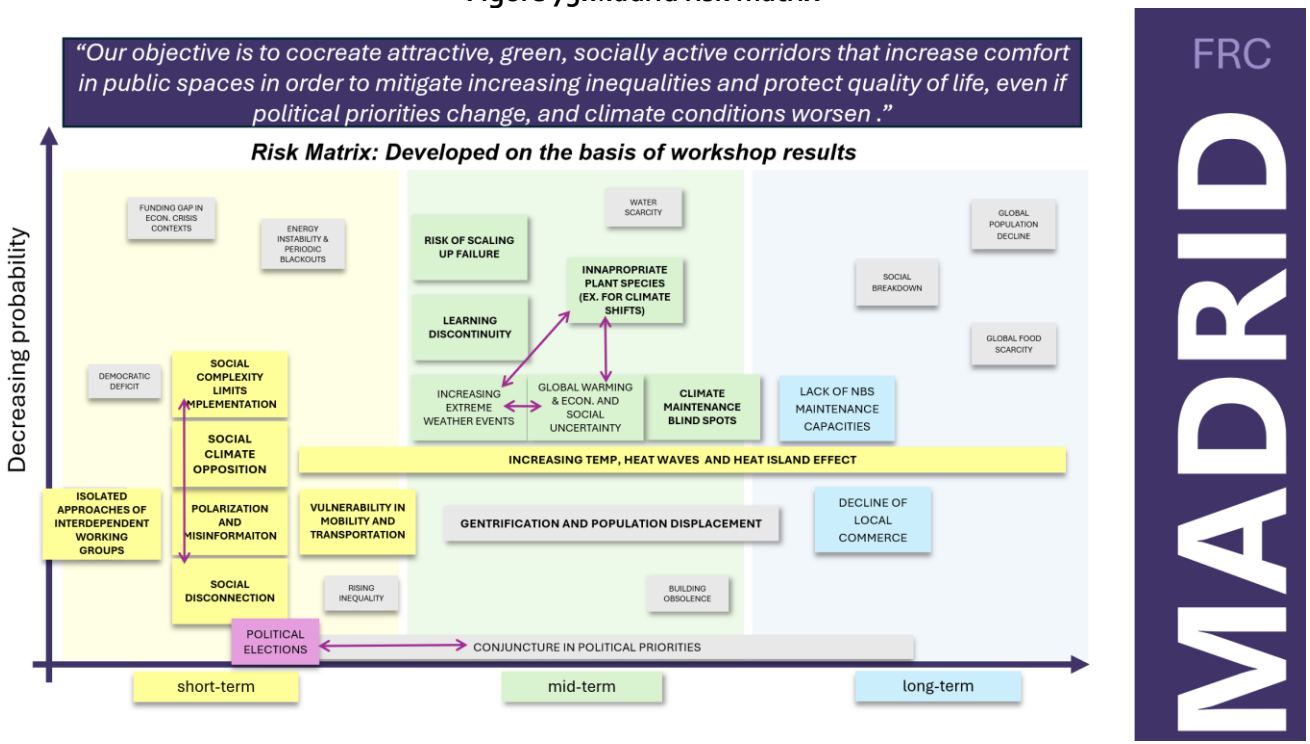
Mediterranean Climatic Zone

Madrid

Workshop 1

During the first workshop, one recurrent risk was identified ("Political Elections"), while other risks exhibited interdependencies and cross-impacts.

Figure 75.Madrid risk matrix



Source: Information gathered from workshop 1

Workshop 2

Five actions were identified during the workshop, which tackled more than half of the original identified risks. These actions were divided into three different groups: Ecosystem, Urban Space, and Regulatory.

Figure 76. Madrid actions identification

MEDITERRANEAN (MED)

Madrid : Cocreate attractive, green, socially active corridors that increase comfortin public spaces in order to mitigate increasing inequalities and protect quality of life, even if political priorities change, and climate conditions worsen

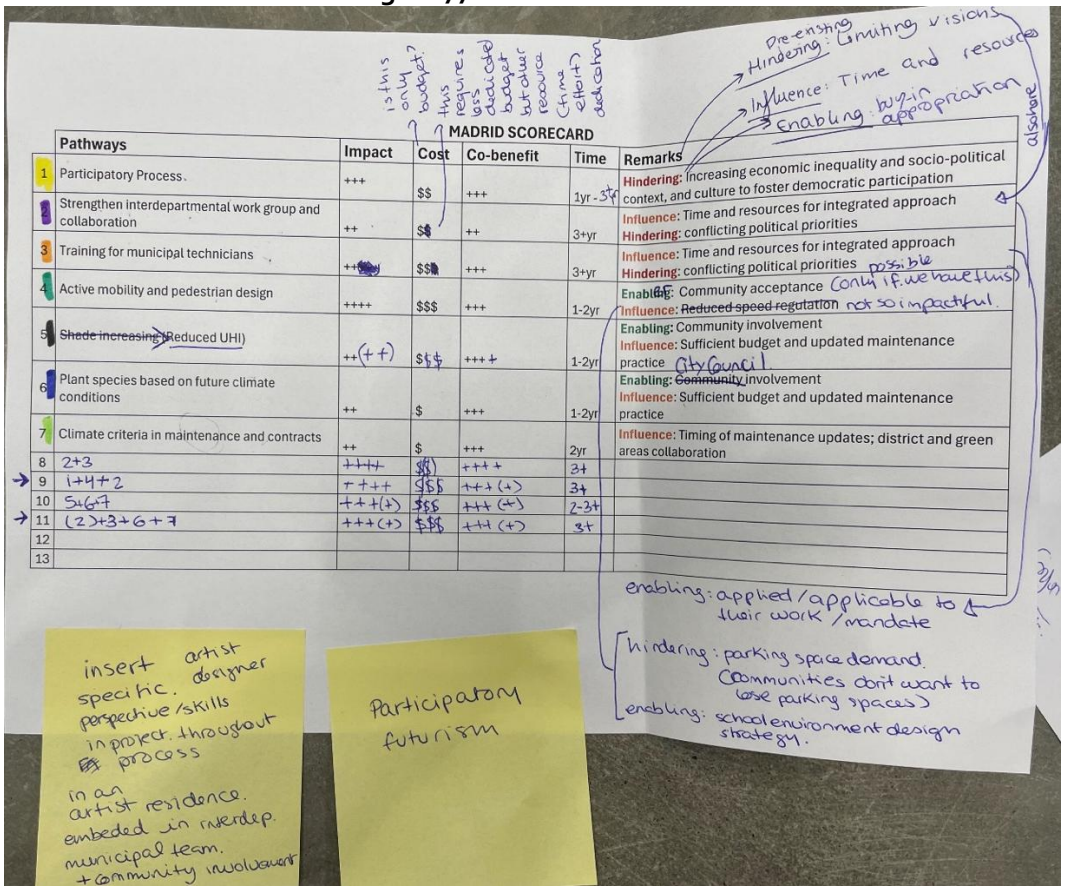
Actions/Solutions to achieve objective	Associated Risk	Impact of Solutions towards objective (+, ++, +++, ++++)	Cost $, $$, $$$, $$$$	Co-benefit or other impacts (- - - to +++)	Remarks, Enabling/Hindering Conditions	Implementation Time
ECOSYSTEM | To attend in the Participatory process	ST: Social complexity limits implementation; ST: Social disconnection; ST: Polarization and misinformation	+++	$$	+++	Increasing economic inequality and socio-political context / participatory processes, and culture to foster democratic participation	1 YEAR
URBAN SPACE | The pilot design favors pedestrian and active mobility Reducing vehicle speed	ST: Vulnerability in mobility and transportation	++	$$	++	Community acceptance, reduced speed regulation	1-2 YEARS
URBAN SPACE | Pilot designed to increase shade and decrease UHI **URBAN SPACE** | plant species selection considering future climate conditions	MT: Increasing extreme weather events; MT: Global warming & Econ. and social uncertainty; S/M/LT: Increasing Temp., Heatwaves, and HIE; ST: Social climate opposition; MT: Inappropriate plant species (Ex. For climate shifts); MT: Water scarcity	++++	$$$	+++	Sufficient budget and updated maintenance practice, community involvement	1-2 YEARS
REGULATORY | Including climate criteria in maintenance and updating contracts	MT: Climate maintenance blind spots; LT: Lack of NBS maintenance capacities	++	$	+++	Timing of maintenance updates, district and green areas collaboration	2 YEARS
ECOSYSTEM | Strengthening interdepartmental working group and collaborative ways of working **ECOSYSTEM** | Training at the official training school for municipal technicians in Madrid	ST: Isolated approaches of interdependent working groups; MT:Learning discontinuity; MT: Risk of scaling up failure; MT: Risk of scaling up failure	++	$	+++	Time and resources for integrated approach, conflicting political priorities impacting dedication	3+ YEARS

Source: Information gathered from Miro board used for workshop 2

Workshop 3

Four different pathways were defined during the workshop. Discussions centred around on how some pathways couldn't have greater impact because of climate and political uncertainty, and how to insert different perspectives and community involvement in the project.

Figure 77. Madrid Scorecard



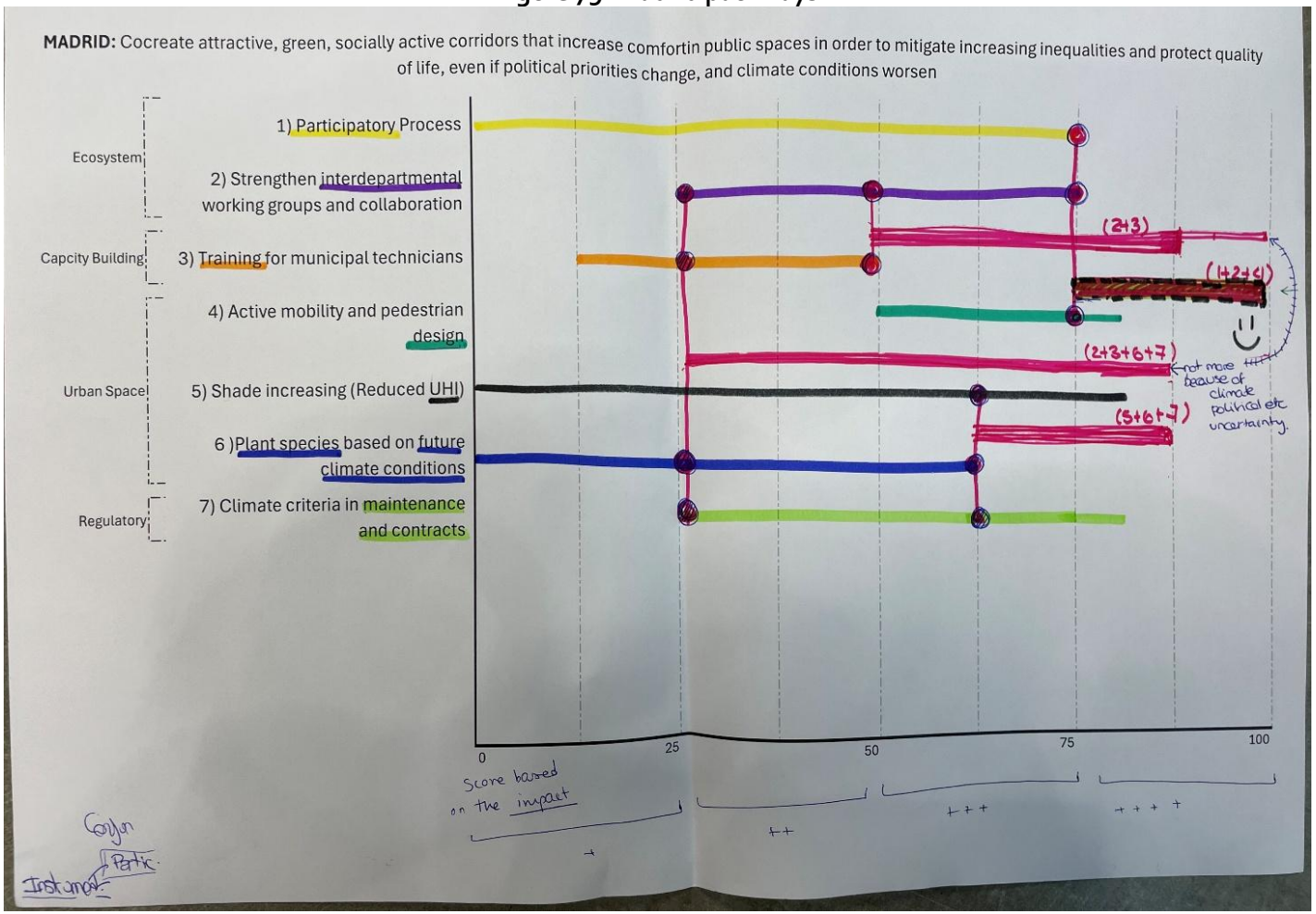
Source: Scorecard filled in during workshop 3

Figure 78. Madrid digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Current Situation	0	0	0
Participatory Process	+++	++	+++
Strengthen interdept. WG and collab.	++	+	++
Training for municipal technicians	++	++	+++
Active mobility and pedestrian design	++++	+++	+++
Reduce UHI	+++	+++	++++
Plant spp. based on future climate conditions	++	+	+++
Climate criteria in maintenane and contracts	++	+	+++
Strengthen interdept. WG and collab. + Training for municipal technicians	++++	+	++++
Participatory Process + Strengthen interdept. WG and collab. + Active mobility and pedestrian design	++++	+++	+++
Reduce UHI + Plant spp. based on future climate conditions + Climate criteria in maintenane and contracts	++++	+++	+++
Strengthen interdept. WG and collab. + Training for municipal technicians + Plant spp. based on future climate conditions + Climate criteria in maintenane and contracts	++++	+++	+++

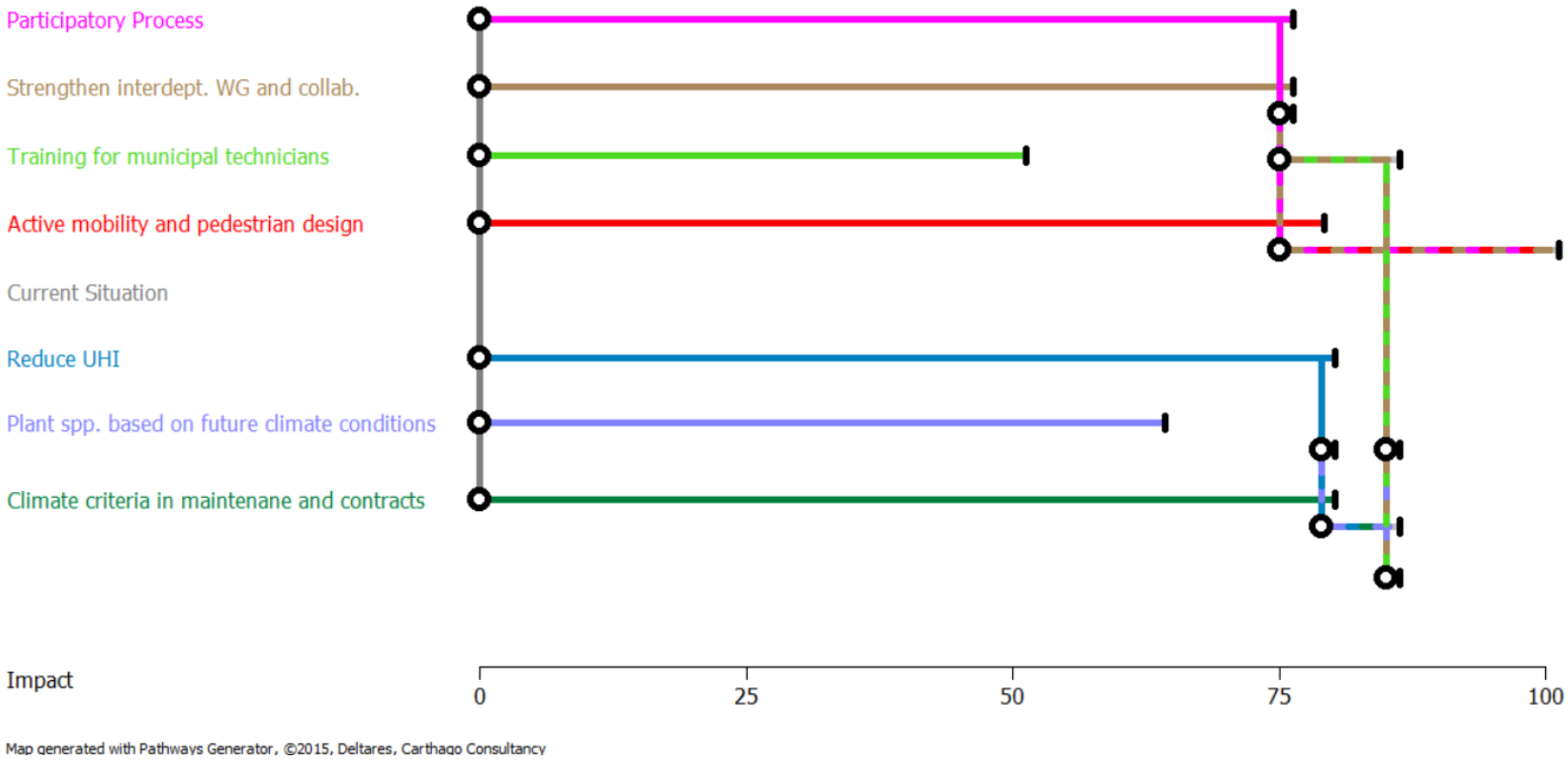
Source: T2.2 result digitisation

Figure 79. Madrid pathways



Source: Pathways filled in during workshop 3

Figure 80. Madrid digitised and approved pathways



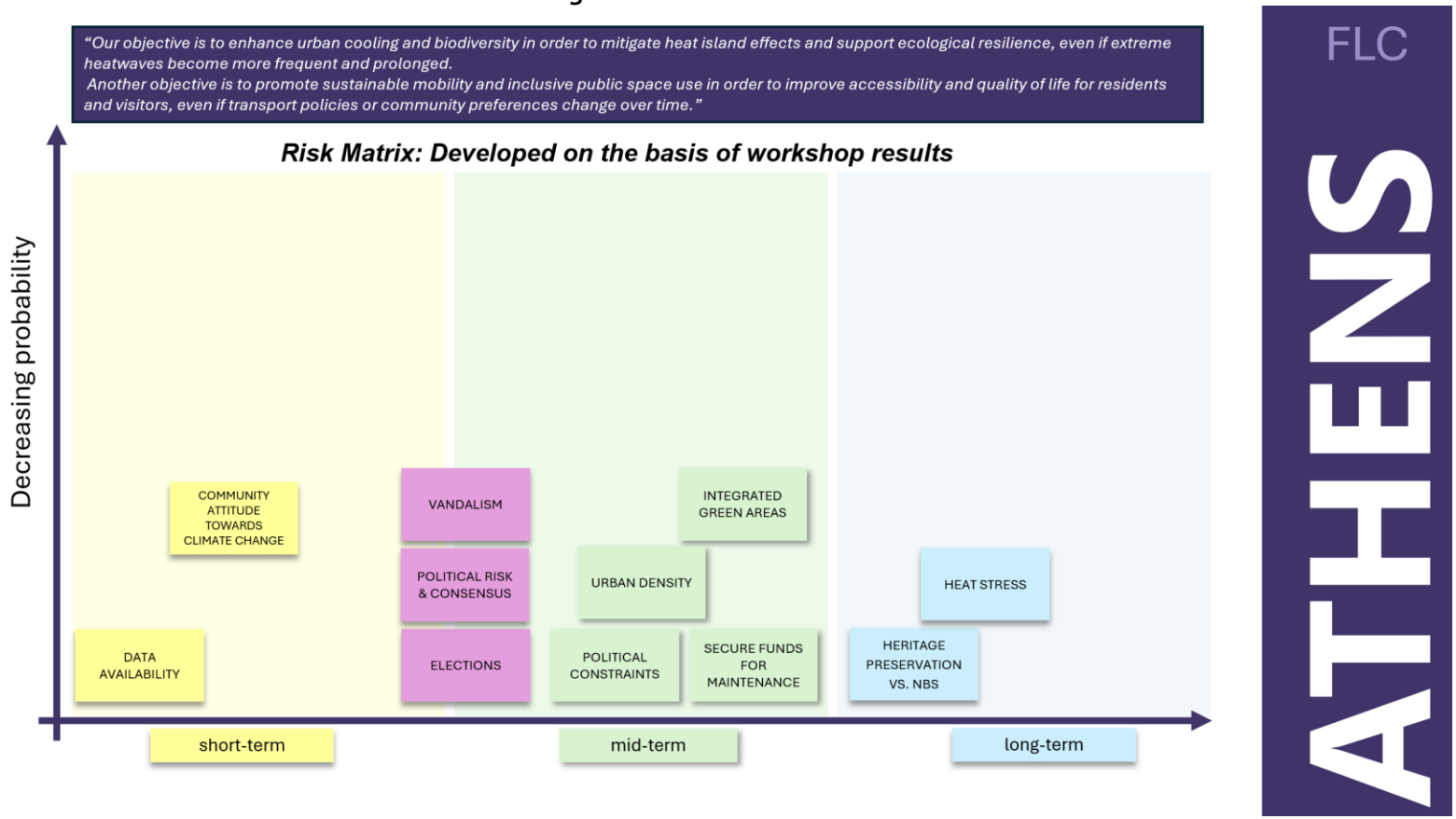
Source: T2.2 result digitisation with Pathways Generator

Athens

Workshop 1

During the workshop, three recurrent risks were identified: “Vandalism”, “Political Risk & Consensus”, and “Elections”.

Figure 81. Athens risk matrix



Source: Information gathered from workshop 1

Workshop 2

Three different actions were identified to tackle all the risk from the previous workshop.

Figure 82. Athens actions identification

Athens : Enhance urban cooling and biodiversity in order to mitigate heat island effects and support ecological resilience, even if extreme heatwaves become more frequent and prolonged. And promote sustainable mobility and inclusive public space use in order to improve accessibility and quality of life for residents and visitors, even if transport policies or community preferences change over time

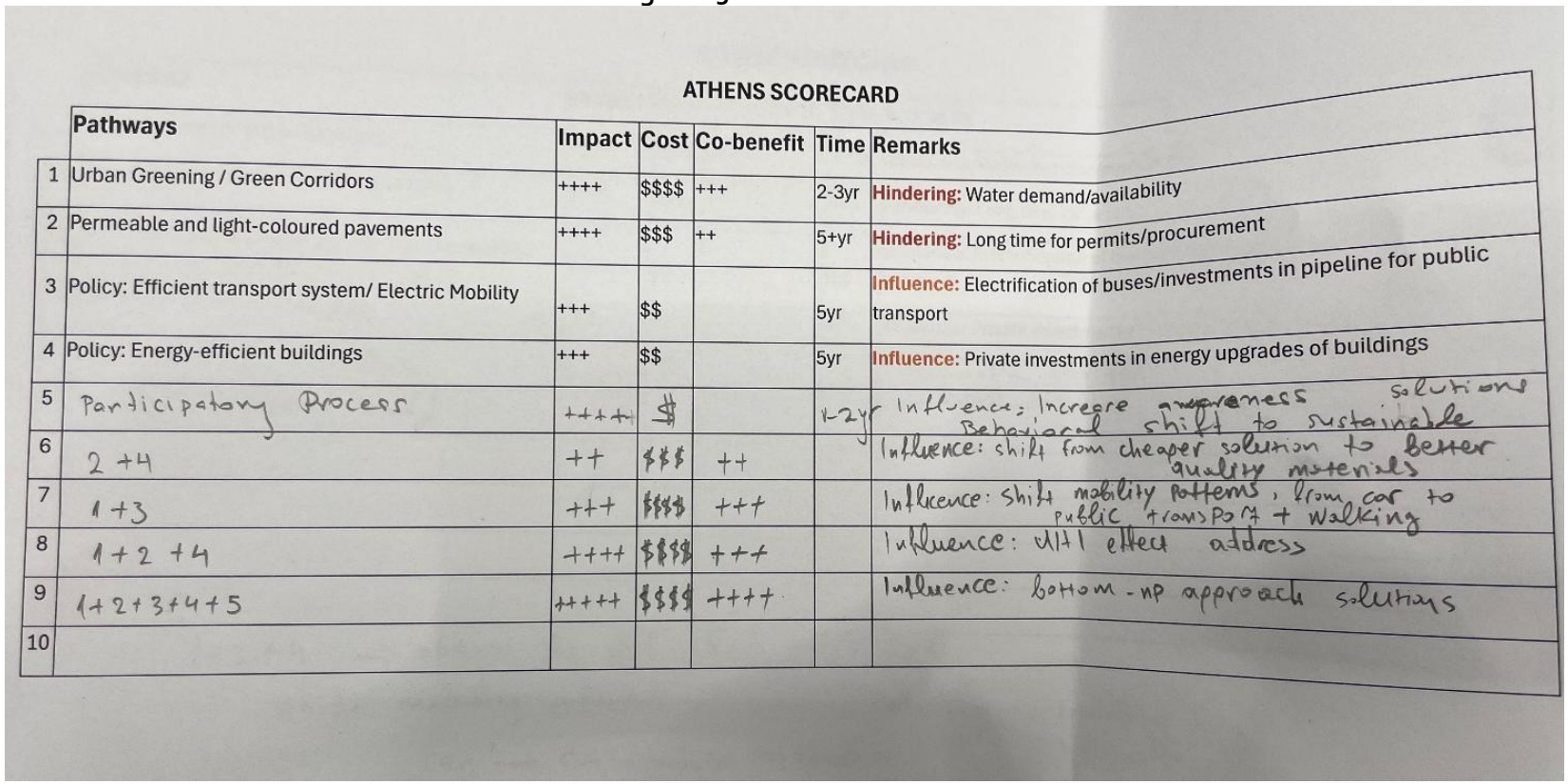
Actions/Solutions to achieve objective	Associated Risk	Impact of Solutions towards objective (+, ++, +++, ++++)	Cost $, $$, $$$, $$$$	Co-benefit or other impacts (- - - to +++)	Remarks, Enabling/Hindering Conditions	Implementation Time
Urban greening /green corridors	MT: Urban density; MT: Secure funds for maintenance; MT: Integrated green areas; S/MT ROR: Vandalism	++++	$$$$	+++ (air pollution decrease, improve health)	Water demand/availability	2-3 years
Permeable and light-colored pavements	LT: Heat stress; LT: Heritage preservation VS. NBS	++++	$$$	++Stormwater management benefits	long time for permits/procurement	5+ years
Policy including efficient transport systems, electric mobility, and energy-efficient buildings.	S/MT ROR: Political risk & consensus; S/MT ROR: Elections; ST: Community attitude towards climate change; ST: Data availability; MT: Political constraints; MT: Integrated green areas	+++	$$ (in terms of changing the mentality)	Social cohesion and well-being, Financial savings	Electrification of buses/investments in pipeline for public transport; private investments in energy upgrades of buildings	5 years

Source: Information gathered from Miro board used for workshop 2

Workshop 3

From the original three actions, the one related to policy was divided into two; an additional action, "Participatory Process", was also added during the workshop. Four different pathways were identified, with the last one combining all the possible actions.

Figure 83. Athens scorecard



ATHENS SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Urban Greening / Green Corridors	++++	$$$$	+++	2-3yr	**Hindering:** Water demand/availability
2	Permeable and light-coloured pavements	++++	$$$	++	5+yr	**Hindering:** Long time for permits/procurement
3	Policy: Efficient transport system/ Electric Mobility	+++	$$		5yr	**Influence:** Electrification of buses/investments in pipeline for public transport
4	Policy: Energy-efficient buildings	+++	$$		5yr	**Influence:** Private investments in energy upgrades of buildings
5	Participatory Process	++++	$		1-2yr	Influence: Increase awareness solutions Behavioral shift to sustainable
6	2 +4	++	$$$	++		Influence: shift from cheaper solution to better quality materials
7	1 +3	+++	$$$$	+++		Influence: shift mobility patterns, from car to public transport + walking
8	1 + 2 +4	++++	$$$$	+++		Influence: ultl effect address
9	1+2+3+4+5	+++++	$$$$	++++		Influence: bottom-up approach solutions
10						

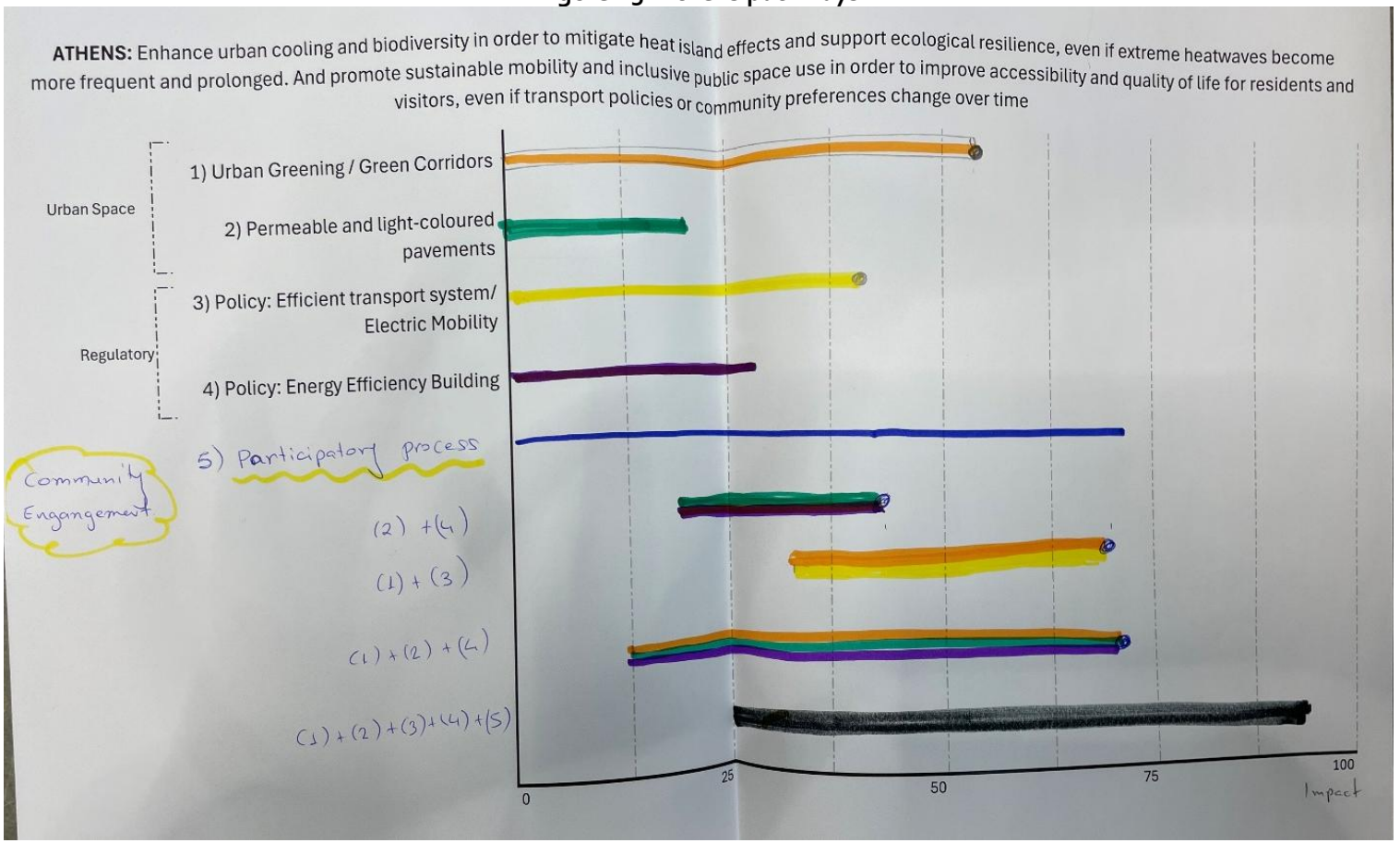
Source: Scorecard filled in during workshop 3

Figure 84. Athens digitised and approved scorecard

Action or pathway	Target effects	Costs	Side Effects
Current Situation	0	0	0
Urban Greening/Green Corridors	+++	++++	+++
Permeable and light-coloured pavement	+	+++	++
Policy: Efficient Transport/Electric Mobility	++	++	0
Policy: Energy Efficiency Building	++	++	0
Participatory Process	+++	+	0
Permeable and light-coloured pavement + Policy: Energy Efficiency Building	++	+++	++
Urban Greening/Green Corridors + Policy: Efficient Transport/Electric Mobility	+++	++++	+++
Urban Greening/Green Corridors + Permeable and light-coloured pavement + Policy: Energy Efficiency Building	+++	++++	+++
Urban Greening/Green Corridors + Permeable and light-coloured pavement + Policy: Energy Efficiency Building + Policy: Efficient Transport/Electric Mobility + Community Engagement	++++	++++	++++

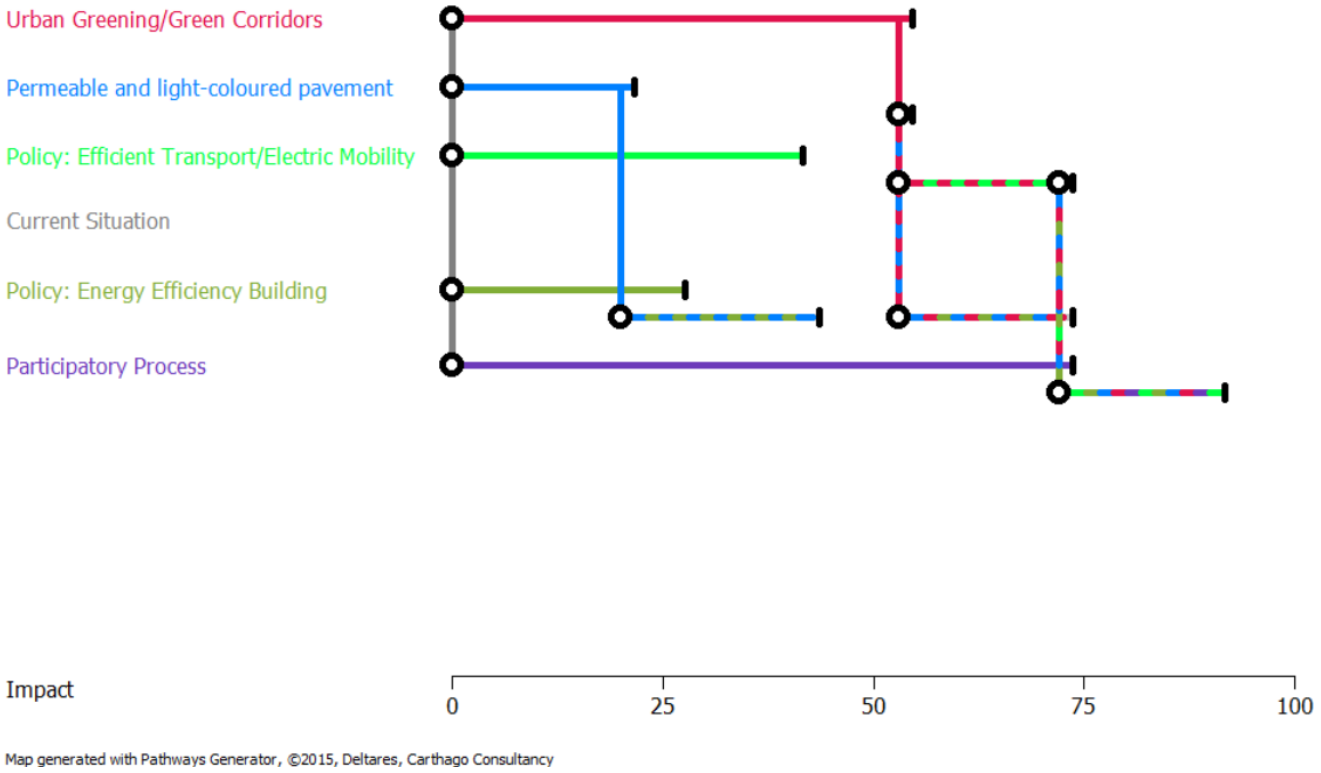
Source: T2.2 result digitisation

Figure 85. Athens pathways



Source: Pathways filled in during workshop 3

Figure 86. Athens digitised and approved pathways



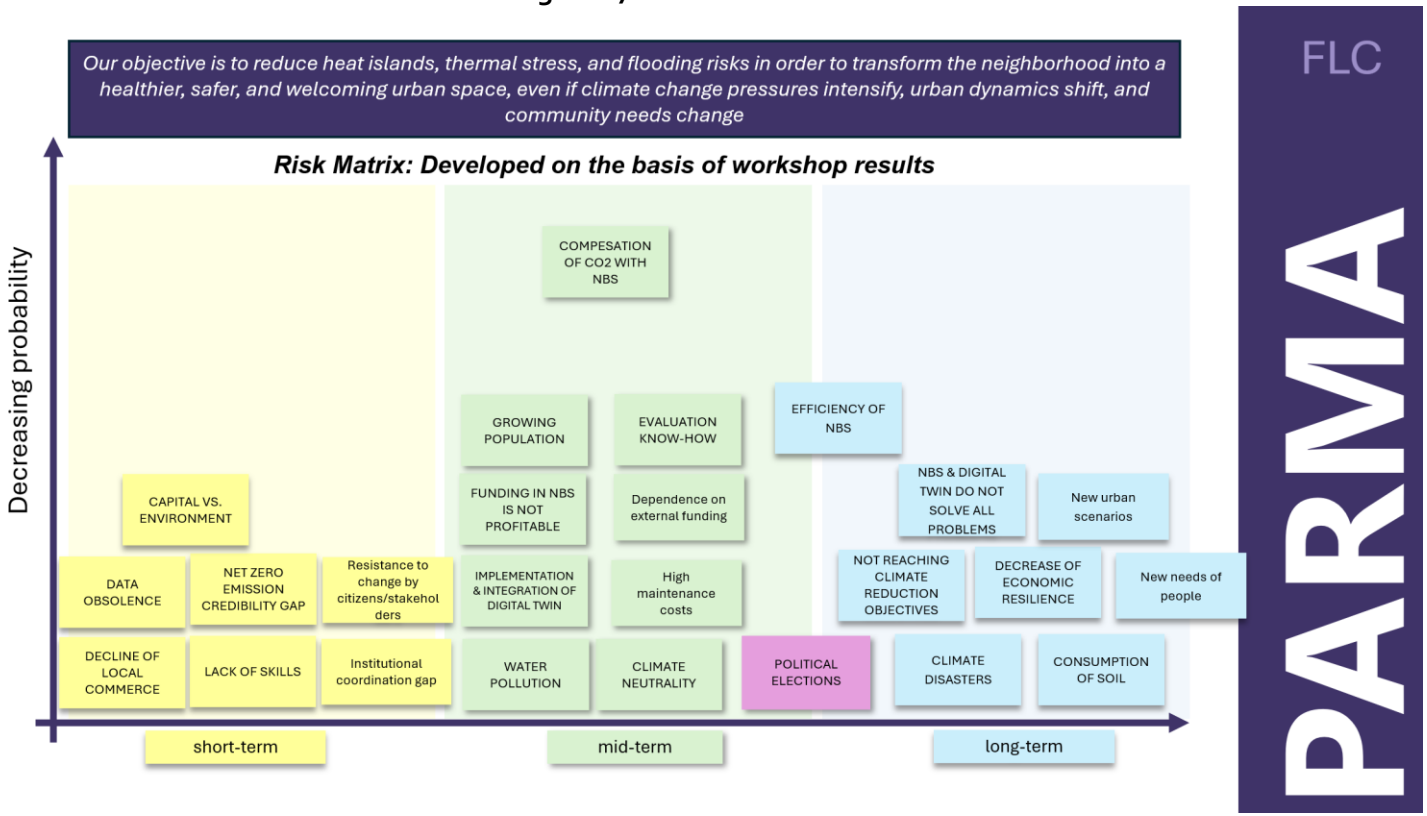
Source: T2.2 result digitisation with Pathways Generator

Parma

Workshop 1

During the first workshop, one recurrent risk was identified, "Political Elections". Most of the risks were classified with high and medium probability.

Figure 87. Parma risk matrix



Source: Information gathered from workshop 1

Workshop 2

Eight different actions were identified during the second workshop, which considered almost all the risks from workshop 1.

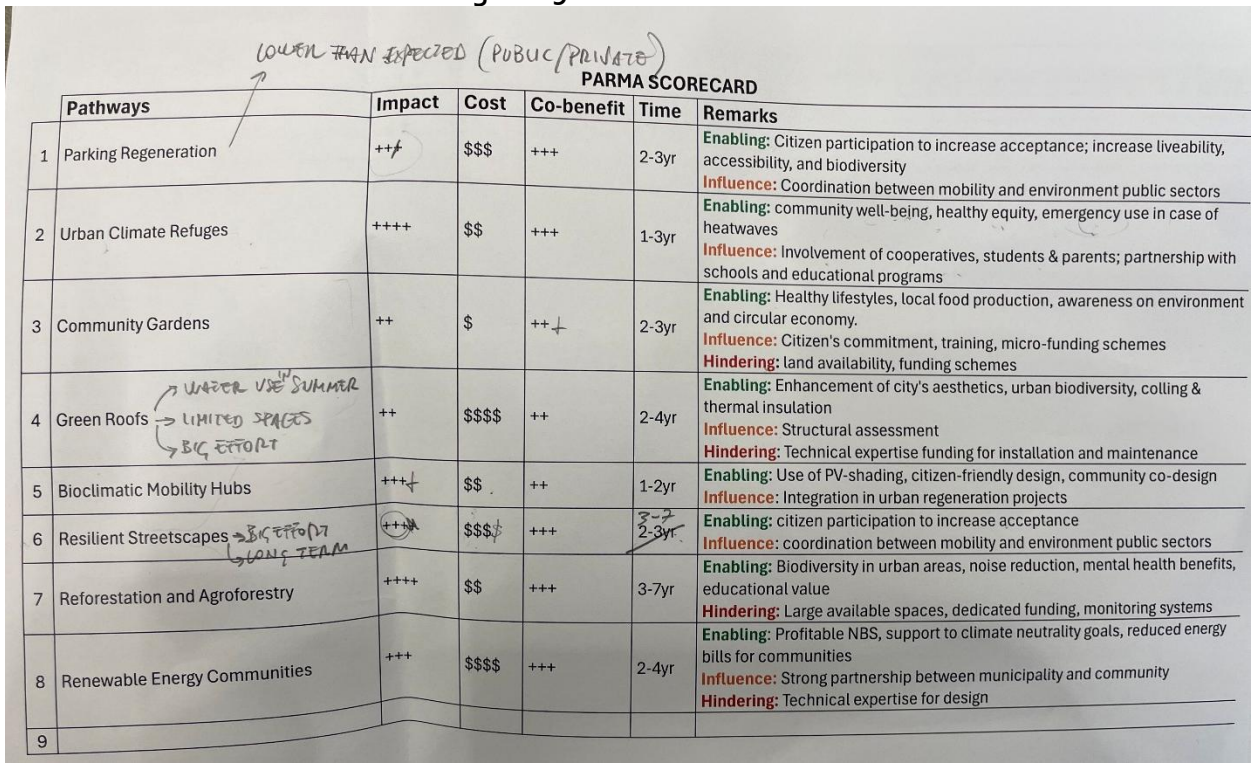
Figure 88. Parma actions identification

Source: Information gathered from Miro board used for workshop 2

Workshop 3

Four different pathways were created, with two of them marked as interesting for the city to develop. One regarding short-term strategy, and the other related to reforestation and agroforestry.

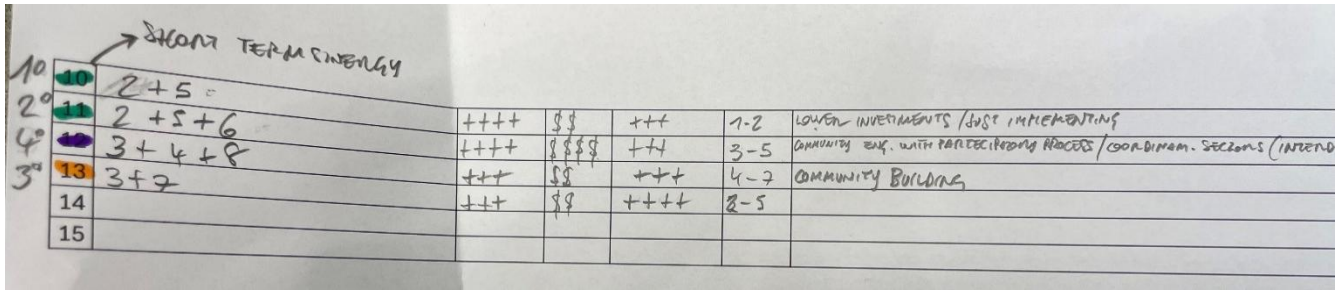
Figure 89. Parma scorecards



LOWER THAN EXPECTED (PUBLIC/PRIVATE)

PARMA SCORECARD

	Pathways	Impact	Cost	Co-benefit	Time	Remarks
1	Parking Regeneration	++	$$$	+++	2-3yr	**Enabling:** Citizen participation to increase acceptance; increase liveability, accessibility, and biodiversity **Influence:** Coordination between mobility and environment public sectors
2	Urban Climate Refuges	++++	$$	+++	1-3yr	**Enabling:** community well-being, healthy equity, emergency use in case of heatwaves **Influence:** Involvement of cooperatives, students & parents; partnership with schools and educational programs
3	Community Gardens	++	$	++	2-3yr	**Enabling:** Healthy lifestyles, local food production, awareness on environment and circular economy. **Influence:** Citizen's commitment, training, micro-funding schemes **Hindering:** land availability, funding schemes
4	Green Roofs → WATER USE IN SUMMER; → LIMITED SPACES; → BIG EFFORT	++	$$$$	++	2-4yr	**Enabling:** Enhancement of city's aesthetics, urban biodiversity, colling & thermal insulation **Influence:** Structural assessment **Hindering:** Technical expertise funding for installation and maintenance
5	Bioclimatic Mobility Hubs	+++	$$	++	1-2yr	**Enabling:** Use of PV-shading, citizen-friendly design, community co-design **Influence:** Integration in urban regeneration projects
6	Resilient Streetscapes → BIG EFFORT → LONG TERM	+++	$$$	+++	~~3-7~~ 2-3yr	**Enabling:** citizen participation to increase acceptance **Influence:** coordination between mobility and environment public sectors
7	Reforestation and Agroforestry	++++	$$	+++	3-7yr	**Enabling:** Biodiversity in urban areas, noise reduction, mental health benefits, educational value **Hindering:** Large available spaces, dedicated funding, monitoring systems
8	Renewable Energy Communities	+++	$$$$	+++	2-4yr	**Enabling:** Profitable NBS, support to climate neutrality goals, reduced energy bills for communities **Influence:** Strong partnership between municipality and community **Hindering:** Technical expertise for design
9						



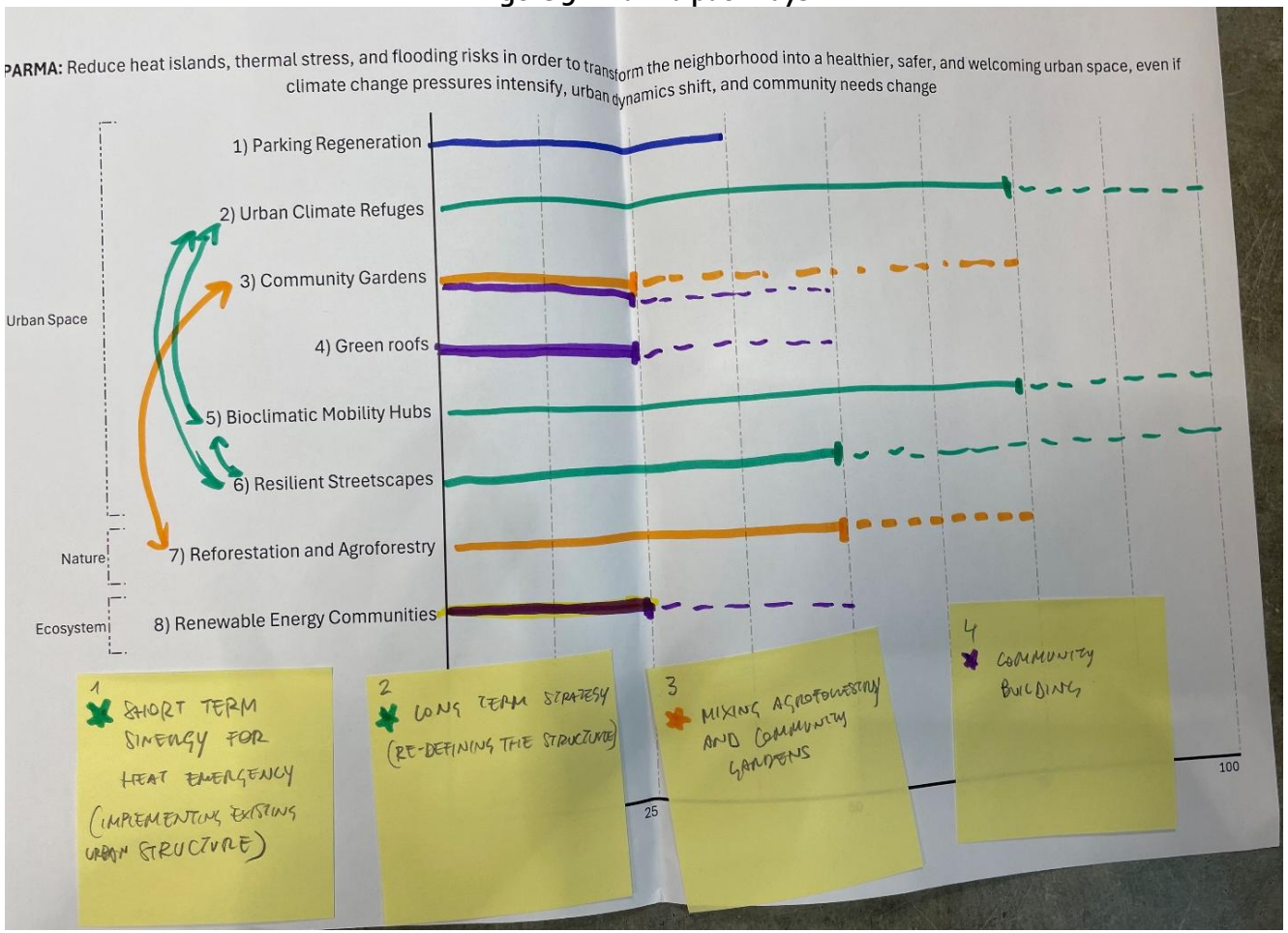
Source: Scorecards filled in during workshop 3

Figure 90. Parma digitised and approved scorecard

ID	Action or pathway	Target effects	Costs	Side Effects
1	Current Situation	0	0	0
2	Parking Regeneration	++	+++	++
3	Urban Climate Refuges	+++	++	+++
4	Community Gardens	++	+	++
5	Green Roofs	++	++++	++
6	Bioclimatic Mobility Hubs	+++	++	+++
7	Resilient Streetscapes	++++	++++	++
8	Reforestation & Agroforestry	+++	+	++
9	Renewable Energy Communities	++	++++	+++
15	Urban Climate Refuges + Bioclimatic Mobility Hubs (short term strategy)	++++	++	+++
16	Urban Climate Refuges + Bioclimatic Mobility Hubs + Resilient Streetscapes (long term)	++++	+++	++++
13	Community Gardens + Green Roofs + Renewable Energy Communities	+++	+++	+++
14	Community Gardens + Reforestation & Agroforestry	++++	+	++++

Source: T2.2 result digitisation

Figure 91. Parma pathways



Source: Pathways filled in during workshop 3

Figure 92. Parma digitised and approved pathways