

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



D8.5 Exploitation and Business Plan & Commercialization Action Report – V2

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Disclaimer

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Executive Summary

This deliverable presents the second iteration of the URBREATH exploitation, business planning, and commercialisation process, reporting on progress achieved by Month 24 in accordance with Task 8.4. It updates the project's market analysis, Intellectual Property Rights (IPR) management framework, and exploitation strategy, and refines the intermediate business plan for the Key Exploitable Results (KERs) developed across the consortium.

URBREATH has developed a varied range of technical, methodological, and participatory outputs that incorporate Nature-Based Solutions, Local Digital Twins, environmental modelling, and Artificial Intelligence (AI)-driven analytics. D8.5 evaluates all twenty-six Exploitable Results, examining their maturity, stakeholder relevance, and potential routes for market adoption. It confirms that URBREATH's integrated offering aligns with a growing European market trend towards combined "Resilience-as-a-Service" solutions.

The deliverable also outlines the structured methodology used by partners to develop individual and joint exploitation plans, including result identification, ownership considerations, target stakeholders, commercialisation routes, and sustainability requirements. Early findings suggest strong potential for public-sector adoption, cross-project synergies, and replication through pilot and follow-on cities.

The intermediate business plan positions URBREATH as a modular ecosystem rather than a single product, enabling multiple business models and long-term sustainability through partner stewardship and alignment with major EU policy priorities. The report concludes with subsequent steps leading towards D8.6 and D8.7, focusing on refining commercialisation actions, validating business models, and ensuring that URBREATH's outcomes are prepared for enduring use beyond the project's funded duration.

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List of Terms and Abbreviations

Abbreviation	Definition
AI	Artificial Intelligence
API	Application Programming Interface
ATC	Athens Technology Center
BAF	Biotope Area Factor
BAS	Basurama Asociación
CA	Climate Alliance
CDES	Communication, Dissemination and Exploitation
CM	Climate Modelling
CoP	Communities of Practice
DBC	Diadikasia Business Consulting
DEDA	DEDA NEXT SRL
DSS	Data Spaces and Standardization
DT	Digital Twin
ENG	Engineering—Ingegneria Informatica SPA
EXUS	EXUS Software Monoprosopi Etairia Periorismenis Efthinis
ER	Exploitable Result
FIC	Fundacion para la Investigacion del Clima
FLC	Follower Cities
FRC	Frontrunner Cities
GIS	Geographic Information System

GOV&SI	Governance and Social Innovation
IAE	Innovation for the Engaged Librarian
IAO	Fraunhofer Institute For Industrial Engineering
ICCS	Institute of Communication and Computer Systems
ICT	Information and Communication Technologies
IoT	Internet of Things
IP	Intellectual Property
IPR	Intellectual Property Rights
KAMK	Kajaanin Ammattikorkeakoulu Oy
KER	Key Exploitable Result
KPI	Key Performance Indicator
LAT40	Latitudo 40 SRL
LDT	Local Digital Twin
LL	Living Lab
M&S	Modelling and Simulation
NBS	Nature-Based Solutions
NCFF	Natural Capital Financing Facility
NZC	NetZeroCities
NWP	Numerical Weather Prediction
OASC	Open & Agile Smart Cities
PESTLE	Political, Economic, Social, Technological, Legal, Environmental
POLIMO	Politecnico Di Milano
PPM	Planning and Policy Making
RIBA	Royal Institute of British Architects
ROI	Return on Investment
SaaS	Software as a Service
SMEs	Small and Medium-sized Enterprises
STP	Systemic Transformation and Participation
SITMP	Sprava Informacnich Technologii Mesta Plzne
SI	System Integration
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAL	Tallinn University of Technology
TEL	Telesto
TRL	Technology Readiness Level
UDT	Urban Digital Twin
UPM	Universidad Politécnica de Madrid
URB	Urbasofia SRL
USAMV	University Of Agricultural Sciences And Veterinary Medicine Of Cluj-Napoca

USTUTT	University Of Stuttgart
VC	virtualcitysystems GmbH
VCS	Virtual City Systems
VIE	Visual Interpretable and Explainable
VITO	Vlaamse Instelling Voor Technologisch Onderzoek N.V.
WMS	Web Map Service
WP	Work package

1 Introduction

This deliverable presents the second iteration of the URBREATH exploitation and business planning process, consolidating the project’s progress in intermediate market analysis, IPR management, commercialisation readiness, and the development of robust exploitation pathways for its Key Exploitable Results (KERs). It builds upon the foundations established in D8.4. It reflects the advancements made in the technical, societal, and stakeholder-driven components of the project by Month 24, as aligned with Task 8.4 as defined in the Grant Agreement.

URBREATH develops a comprehensive ecosystem of tools, methodologies, data infrastructures, and participatory processes that incorporate Nature-Based Solutions (NBS), Local Digital Twins (LDTs), environmental modelling, and AI-driven analytics to promote climate-neutral and resilient urban transformation. D8.5 offers a structured and evidence-based roadmap for the commercialisation and long-term adoption of these assets across European cities. The deliverable details how URBREATH’s technologies and frameworks—ranging from advanced digital twins and AI impact assessment models to co-creation methodologies, stakeholder engagement tools, replication frameworks, and monitoring systems—create a modular portfolio designed to serve various urban stakeholders, including municipalities, public authorities, technology providers, researchers, and community actors.

Central to the report is a comprehensive overview of all twenty-six identified Exploitable Results. These include technical outputs, governance models, participatory tools, and digital infrastructures. Each Exploitable Result (ER) is analysed in terms of scope, maturity, stakeholders, contributing partners, Technology Readiness Level (TRL) progression, and potential for commercial, scientific, or policy applications. Examples encompass Communities of Practice frameworks, Information and Communication Technologies (ICT) tools for engagement, simulation models, advanced digital twins, NBS impact assessment services, dashboards, AI-based prediction tools, geo-analytics components, and participatory mobile applications. Collectively, these ERs illustrate the project’s development towards an interconnected “Resilience-as-a-Service” offering for cities, supporting evidence-based decision-making and urban transformation across various climatic zones.

This deliverable presents a structured exploitation methodology that guides partners in creating individual and joint exploitation plans. The methodology is based on six pillars: identifying targeted results, describing exploitation strategies, evaluating ownership and IPR considerations, defining target stakeholders and markets, conducting risk assessments, and planning resources, timelines, and sustainability actions. Partners’ contributions were analysed to develop a comprehensive view of exploitation intentions across public administrations, research entities, SMEs, and civic organisations. The methodology promotes consistency across plans and aligns with the broader URBREATH roadmap, including replication activities, stakeholder engagement structures, and technical development milestones.

The report also incorporates market and competition analysis, highlighting convergence between climate adaptation, digital twin technologies, environmental modelling, and AI-driven urban analytics. This convergence is fostering the development of an integrated urban resilience market, in which URBREATH is well positioned. The project’s modular ecosystem supports various business models, such as Software as a Service (SaaS) offerings, consultancy services, open toolkits, and replication pathways,

and aligns with major EU policy frameworks including the Green Deal and the EU Mission on Climate-Neutral and Smart Cities. This positioning enhances the project's appeal and the scalability of its results across Europe.

D8.5 also describes the intermediate business plan and sustainability model. Instead of concentrating on a single commercial product, URBREATH adopts a portfolio-based approach that supports varied exploitation strategies for different ERs. This includes establishing operational governance pathways, maintenance and stewardship roles for partners, documentation and licensing considerations, and mechanisms for the ongoing development of the project's tools, data infrastructures, and methodologies beyond its funded period. The sustainability model aims to ensure long-term viability through institutional embedding, partner stewardship, and coordinated co-creation with local authorities, as shown in Front Runner Cities (FRCs) and Follower Cities (FLCs).

The deliverable concludes by synthesising the main findings of the exploitation process to date. It highlights the strong market potential of the URBREATH ecosystem, the maturity of several KERs approaching pre-commercial readiness, the alignment with EU policy priorities, and the collaborative momentum created through pilot activities, stakeholder engagement, and partner contributions. It also outlines the next steps that will lead to D8.6 and D8.7, including validation of business models, refinement of individual partner exploitation plans, and preparation of a fully developed, final exploitation and commercialisation strategy by Month 48. These next steps reinforce the overarching goal of ensuring that URBREATH's innovations achieve real-world impact, scalability, and sustained use across European cities beyond the project's lifespan.

1.1 Approach for Work Package and Relation to Other Work Packages and Deliverables

The approach used in Work Package (WP) 8 aims to guarantee the coherent exploitation, commercialisation, and long-term sustainability of URBREATH's results by incorporating contributions from all technical, societal, and governance-related parts of the project. WP8 serves as the primary mechanism through which the project's innovations—including digital tools, environmental models, stakeholder engagement techniques, and Nature-Based Solutions frameworks—are transformed into credible, market-ready assets. As outlined in the Grant Agreement, WP8 is accountable for shaping and implementing the exploitation roadmap, conducting ongoing and final market assessments, managing IPR, and producing successive versions of the Exploitation and Business Plan (D8.4, D8.5, D8.6, D8.7). These outputs operationalise Task 8.4 and maintain continuity throughout the project's lifecycle.

The deliverable is based on a structured approach that combines knowledge from the project's interconnected work packages. Technical Work Packages—specifically WP3, WP4, WP5, and WP6—offer the core digital solutions, simulation models, AI components, co-creation tools, environmental data infrastructures, and monitoring frameworks that form the foundation of the Key Exploitable Results. Their outputs define the technological maturity, functional scope, and integration capabilities that determine the exploitation potential of each result. The technology readiness levels and pilot city testing cycles outlined in the Grant Agreement, as well as those further detailed throughout the project,

directly influence the exploitation strategy by establishing which results can progress towards commercialisation, which require further validation, and which are better suited to open dissemination or policy adoption.

Stakeholder-focused packages, particularly WP2 and WP5, contribute social innovation approaches, community engagement processes, co-creation frameworks, and living lab interactions that support URBREATH's emphasis on participatory and demand-driven innovation. These inputs help ensure that KERs align with the priorities, capacities, and operational realities of cities, public administrations, urban planners, community groups, and private-sector actors. They also provide the evidence needed for replication and requirements-mapping to adapt exploitation pathways to different climatic, governance, and institutional contexts.

WP7 offers the replication mechanisms, standardisation efforts, and cross-city learning frameworks that support scalability and transferability across different contexts. These elements are crucial for establishing post-project sustainability models, identifying pathways for institutional integration, and preparing outcomes for wider adoption across Europe. The Grant Agreement explicitly connects WP7 to the long-term valorisation of URBREATH results, and its outputs directly contribute to the exploitation and business planning led by WP8.

WP8 consolidates these inputs into a cohesive commercialisation and sustainability strategy through a systematic, iterative approach. This approach encompasses market analysis, stakeholder mapping, IPR management, Strengths, Weaknesses, Opportunities and Threats (SWOT) and Political, Economic, Social, Technological, Legal, Environmental (PESTLE) assessments, and the development of individual and collaborative exploitation plans tailored to the profiles of URBREATH partners, including public entities, research institutions, Small and Medium-sized Enterprises (SMEs), technology providers, and civic organisations. The deliverable also aligns with the communication and dissemination frameworks established in WP8's earlier tasks, ensuring consistency across exploitation, dissemination, and communication activities, as outlined in the Communication, Dissemination & Exploitation Roadmap (D8.1) specified in the Grant Agreement.

Overall, the relationship between WP8 and the other work packages is reciprocal and continuous. Technical, social, and governance work packages provide the substance of the results to be exploited. At the same time, WP8 transforms those results into viable, long-term assets through coordinated business planning, commercial strategy design, and sustainability modelling. This interconnected approach ensures that the project's outcomes are positioned for real-world adoption, long-term continuity, and contribution to EU climate-neutrality objectives beyond the funded duration of URBREATH.

1.2 Methodology and Structure of the Deliverable

The methodology used in this deliverable follows a systematic approach aimed at assessing position and promoting each Exploitable Result (ER) for maximum impact in relevant markets. The main methodological components include:

- **Market Analysis and Stakeholder Identification:** A comprehensive analysis is conducted to identify target markets and stakeholder groups—such as municipalities, policymakers, urban planners, private sector actors, and community organisations. Their needs, influence, and potential for adoption are profiled.
- **Exploitation Strategy Development:** Tailored strategies are developed for each ER. These include commercialisation pathways, business models, and stakeholder engagement tactics, aligning ER deployment with urban policy frameworks and operational contexts.
- **SWOT Analysis and Risk Assessment:** Each ER is analysed through a SWOT framework (Strengths, Weaknesses, Opportunities, Threats), supported by risk management strategies that cover regulatory, financial, and technical aspects.
- **Intellectual Property (IP) Management and Dissemination Planning:** The approach incorporates IP protection strategies and dissemination frameworks that strike a balance between open access and proprietary control, depending on the ER's market relevance.

The **structure** of the deliverable is organised to provide a full picture of the exploitation and commercialisation roadmap for URBREATH's ERs:

- Section 1: Introduction – Overview of the deliverable's purpose, scope, and its alignment with other project components
- Section 2: Exploitable Results Description – Technical and market details for each ER
- Section 3: Individual and Joint Exploitation Plans – Detailed strategies at partner and consortium level
- Section 4: Business Plan and Sustainability Model – Market analysis, go-to-market strategy, risk management, and sustainability pathways
- Section 5: Market & Competition Updates – Sector-specific updates and positioning
- Section 6: Stakeholder Engagement Plan – Tools, strategies, and engagement methodologies
- Section 7: Conclusions – Summary of findings and outlook

2 Exploitable Results (ERs) Description

2.1 The URBREATH Project Final List of Exploitable Results (ERs)

The URBREATH project has produced a thorough set of Exploitable Results (ERs), each representing a unique technological, methodological, or service-oriented innovation aligned with the project's goal of promoting climate-neutral, resilient, and inclusive urban transformation. These ERs were identified through a collaborative process involving all project partners and reflect the interdisciplinary nature of the URBREATH approach, integrating Nature-Based Solutions (NBS), digital tools such as LDTs, participatory governance frameworks, and advanced AI-driven analytics.

The final list of 26 ERs has been compiled based on their potential for adoption, scalability, and impact across various urban settings. Each ER is linked to specific Work Packages (WPs) and tasks and is accompanied by a detailed exploitation profile including ownership, contributors, target users, readiness level, and possible commercial or policy relevance. This section introduces each ER individually, offering a clear and structured description to support their integration into stakeholder decision-making, policy agendas, and innovation markets.

2.1.1 ER1 – Communities of Practice (CoP)

This result pertains to a structured model for Communities of Practice (CoP), intended to connect city teams, technical partners, and stakeholders across the nine pilot cities. It operates through methodologies developed in WP2 and WP5 and supports replication and road-mapping activities in WP7. FRAUNHOFER and VLO are the owners, with contributions from POLIMI, VLO, CA, LC, TEL, ENG, OASC, USTUTT, and city partners. The related tasks encompass WP2, WP5, and WP7. TRL advances from 5 to 7 during the project.

The commercial and business exploitation will concentrate on providing services and training, practitioner certification, KPI monitoring support, and advisory services. Cities have expressed a need for repeatable processes to manage NBS-related initiatives. The model provides a clear structure, engaging training and certification components, and KPI frameworks. However, challenges include variability in city capacity, reliance on robust data and dashboards, and difficulties in shared ownership, which could result in a single point of contact being obscured. Opportunities exist to align with European Mission Cities and to offer certification as an ongoing service. Potential threats involve city team turnover, reluctance to adopt due to perceived complexity, or incompatibility with existing networks. The main competitors are other city networks or clusters offering similar knowledge exchange forums.

The primary target market comprises city administrations, municipal utilities, and regional agencies, with secondary users such as RTOs, SMEs, and NGOs. External commercial offerings could start within 6 to 12 months. Early returns are expected to be modest, mainly through training fees and consultancy, with greater potential when linked to replication initiatives. FRAUNHOFER and others plan to integrate

the outcome into their urban innovation services, publishing roadmaps and providing certification and KPI support services. This is recognised as a Key Exploitable Result.

2.1.2 ER2 – ICT tools, methods and processes for stakeholder engagement

This result includes both a web-based and smartphone application for stakeholder engagement, awareness, and communication. TEL owns the mobile application, while ENG contributes to the web-based tool. Related to Task 4.2, the TRL advances from 4 to 6.

The applications are designed to promote public participation and interaction with city authorities, enabling citizens to report issues and provide feedback. Their advantages include being easy to use and adaptable, with potential for customisation and across different areas. However, they face challenges such as difficulty integrating certain features, especially when existing applications already perform similar roles. There are great opportunities to combine multiple tools into a single mobile app and to adapt it for internal use within organisations. Barriers include inconsistent follow-up by public authorities and limited public budgets. Competing tools, such as YourPriorities, GoVocal, and Decidim, offer some benefits, particularly as open-source options, as in-house IT teams can manage them.

The target market comprises local authorities, NGOs, and policymakers. It is being developed as part of TEL's product and service portfolio. It is regarded as a Key Exploitable Result because of its significance for participatory governance and civic engagement.

2.1.3 ER3 – Innovative simulation models for urban regeneration and climate neutrality

This software-based result includes rapid simulation models that generate datasets related to heat stress under current and future climate scenarios, as well as urban greening indicators, such as the 3/30/300 rule. VITO owns this ER, with LAT40 and DEDA contributing. It is linked to Task 3.4 and progresses from TRL 6 to TRL 8.

The risk of exploitation is high as cities increasingly seek data tools to support climate adaptation and greening strategies. High-resolution, flexible simulation capabilities and strong integration of remote sensing with physical modelling characterise the models. However, the competitive landscape is crowded with similar tools and frameworks, which makes differentiation challenging. Opportunities exist in the growing demand for climate resilience planning tools and the increased integration of such models into decision-making platforms. A lack of interoperability standards and the availability of free data sources are key threats.

Primary customers include municipalities, NGOs, and environmental agencies. Commercialisation is expected in the final year of the project. The outcome will broaden the research portfolio and support the development of new services. It is regarded as a Key Exploitable Result.

2.1.4 ER4 – Advanced digital twins with participatory urban planning functionalities of restructured neighbourhoods

This result combines three other ERs - the 3D visualisation tools from VCS, the mobile app from TEL, and the web app from ENG – into a comprehensive digital twin solution enhanced with participatory features. It is connected to Tasks 4.1 and 4.2 and advances from TRL 4 to TRL 6.

The aim is to equip municipalities with advanced tools that combine spatial visualisation with stakeholder engagement, thus enhancing public participation and transparency in decision-making. Although the individual elements already exist, their integration creates a more powerful instrument for co-creation and participatory planning. There are no clearly defined weaknesses, threats, or competitors in the response, likely because the product is in a composite and early phase. The target audience includes municipalities and city planning departments. While not explicitly classified as a KER, the integration indicates a significant value proposition for cities seeking digital twin capabilities linked to participatory planning.

2.1.5 ER5 – Services, models and tools for climate effect impact assessment

This dataset-based result, developed by FIC, comprises seasonal and long-term climate scenarios with high-resolution indices customised for each pilot city. It relates to Tasks 3.2 and 3.3 and progresses from TRL 7 to TRL 8.

The exploitation potential is considered high, particularly given the rising demand for climate risk assessments across various sectors, including smart agriculture, infrastructure, insurance, and emergency planning. Its strength lies in its high resolution and advanced modelling techniques. However, challenges exist in acquiring accurate observed weather data, especially in complex terrains. Another risk is that users may turn to free, less precise climate datasets due to limited technical skills or financial resources. The availability of free services from national and international organisations poses a competitive threat.

The primary market covers both public and private sectors. The dataset is prepared for immediate use. It is regarded as a Key Exploitable Result, as it can notably influence decision-making outcomes, especially in climate-sensitive settings.

2.1.6 ER6 – Clustering of NBS and hybrid approaches towards improved climate neutrality

This methodological result, developed by TAL with contributions from POLIMI and FRAUNHOFER, offers an innovative framework that links the stages of the Plan of Works with clusters of Nature-Based Solutions and supporting digital tools. It enables the systematic identification of effective tool–NBS combinations and allows their evolution and interactions to be monitored consistently throughout the different stages of project development and implementation. ER6 is associated with Tasks 4.4, 5.6, 6.1, and 6.2. It advances from TRL 1 at the start of the project to TRL 7 at its end, indicating its development from a conceptual approach to a validated framework suitable for real planning contexts.

The exploitation potential is high, as the framework supports scalable planning and implementation of NBS and hybrid solutions in future urban and environmental projects. Its main strength is enhancing coordination and decision-making by providing a clear, structured overview that ensures consistent integration of tools and solutions across project stages. At the same time, its adaptability may be limited in very diverse regulatory, spatial, or stakeholder contexts, where customisation efforts could be significant. Opportunities arise from the increasing interest in systematic NBS planning and the potential for widespread adoption in future projects by both public and private stakeholders. However, the complexity of adapting the framework to different settings, as well as the availability of open-source information and alternative planning approaches, pose relevant threats and competitive pressures. The primary target market includes public authorities, urban planners, and private organisations involved in NBS deployment and climate-neutral urban development. Time-to-market and return on investment are not yet defined and will depend on how the methodology is further integrated into organisational processes and service offerings. At this stage, ER6 is not considered a Key Exploitable Result.

2.1.7 ER7 – NBS Evidence-Based Impact Assessment and Evaluation Framework

This exploitable result involves developing a comprehensive monitoring and impact assessment methodology to evaluate the effectiveness and success of Nature-Based Solutions (NBS). The result is co-owned by USTUTT and IAO and is linked to Task 5.6. The initial Technology Readiness Level is 1, with a final targeted TRL of 6, indicating significant progress from concept to validated methodology.

The main exploitation pathway identified is the development of a methodology that holds significant relevance for urban sustainability stakeholders, including policymakers, planners, and researchers. Given the increasing demand across Europe for tools that can monitor, evaluate, and verify the effectiveness of urban NBS interventions, this outcome has high exploitation potential. Its strength is in its capacity to incorporate multiple impact dimensions – environmental, economic, and social – within a single framework, making it suitable for diverse urban settings and adaptable to various stakeholder needs. Its application in both Front Runner Cities (FRCs) and Follower Cities (FLCs) throughout the project allows for practical testing, validation, and refinement of the framework.

However, there are weaknesses to consider. The framework is new and therefore lacks an established track record, which may create barriers to adoption. Moreover, the diversity of cities in terms of geography, size, and institutional capacity can present standardisation challenges. The methodology's effectiveness may also be limited by data availability and the ability to collect consistent data over time, factors that depend on long-term engagement from participating cities.

Opportunities for this ER include its high relevance to ongoing European and international efforts to monitor urban resilience and climate neutrality. There is strong potential for the methodology to be adopted by cities beyond the project, either as a standalone framework or integrated into broader NBS monitoring systems. It may also become valuable for private sector consultants, academic institutions, and urban planning authorities.

In terms of threats, data collection may be impeded by technical or administrative constraints. Furthermore, competition might emerge from other open-source frameworks developed in concurrent European projects, which could have overlapping functionalities or use similar indicators.

The primary target markets include the public sector (local governments and municipalities), as well as private consultancies and NGOs involved in sustainable urban development. The partners regard this result as a Key Exploitable Result, given its potential to inform and structure long-term NBS assessments and planning strategies.

2.1.8 ER8 – URBREATH Replication Methodology

ER 8 involves developing a replication methodology based on the URBREATH approach. This methodology incorporates validation components and mechanisms to understand, refine, and scale the processes used in the project. A key feature of this approach is its dual implementation logic: while the FRCs focus on actual deployment of NBS, the FLCs concentrate on planning, facilitating replication across different contexts.

The effort is collectively supported by POLIMI (WP 2 Leader), ENG (Task 4. 4 Leader), FRAUNHOFER (WP 7 Leader), and all WP 7 task leaders. It connects to all tasks in WP 2, Task 4.4, and WP 7. The methodology begins development at TRL 1 and aims to reach TRL 7 by the end of the project, reflecting its progression into a validated and deployable process.

Designed for applicability to other projects involving city engagement and urban regeneration, it is described as scalable, adaptable, and capable of accommodating both generalised and localised activities. Key strengths include co-creation sessions, city engagement, interactive methodologies, and technical support, which enable local stakeholders to shape the process and enhance long-term uptake. Challenges may arise when deploying the methodology in projects with similar themes, where overlapping approaches could reduce its uniqueness or perceived added value. Nonetheless, the inclusion of concrete process flows and toolsets improves its integration into public sector planning and decision-making procedures. Emphasis is placed on data collection and genuine stakeholder participation as critical success factors.

Like many methodological frameworks, its main competitors are other urban innovation projects proposing similar co-creation or planning processes. The methodology is expected to serve cities, private sector actors, NGOs, and SMEs involved in climate resilience and urban transformation.

The partners anticipate a gradual integration of the methodology into institutional practices, enabling progressive adoption through real-world applications and adaptation of existing urban planning routines. This outcome is regarded as a Key Exploitable Result due to its broad applicability and central role within the URBREATH vision.

2.1.9 ER9 – Novel Business Models (Financing Models)

ER9 involves creating innovative business and financing models to support the commercialisation and long-term viability of urban development technologies and Nature-Based Solutions (NBS). The ER is proposed by DBC, with input from South Pole. It links to Task 7.4 and begins at TRL 2, aiming to reach TRL 7 by the project's end.

This exploitable result aims to overcome one of the primary barriers to urban regeneration—the lack of sustainable financing mechanisms. It proposes business model structures that address the distinct

challenges of deploying green infrastructure and NBS at scale. Its high potential for exploitation comes from its relevance to the economic viability of climate adaptation projects and its capacity to unlock financing from both public and private sources.

Its strength lies in supporting the economic sustainability of urban climate initiatives and providing a structured approach to financing these efforts. However, a key weakness is that the success of these models depends heavily on their economic feasibility and their alignment with actual financing streams. The attractiveness and robustness of financial logic will influence whether these models are adopted. Opportunities include a growing interest in public-private partnerships and the increasing availability of climate financing tools at European and international levels. Nonetheless, there is significant competition from other business models and financial frameworks developed under similar projects or by commercial consultants.

The target market for this result encompasses municipalities, private investors, international donors, and NGOs involved in climate and resilience finance. Immediate or near-term deployment is expected after project completion.

The partners envisage integrating the business model frameworks into their broader research and consulting portfolios. Interestingly, this result is not classified as a Key Exploitable Result, likely because it functions as an enabling tool for other KERs rather than a standalone commercial product.

2.1.10 ER10 – Dynamic Layer Plugin

ER10 is a software tool that enhances the virtualcitysystems GmbH (VCS) Map platform by enabling users to dynamically add service data from URLs or catalogues to a Local Digital Twin. The ER is developed and owned by VCS and linked with Tasks 4.1, 4.2, and 4.3. It starts at TRL 1 and aims to reach TRL 8 by the end of the project.

The tool is designed for direct integration into the VC Map 3D viewer, improving usability and data integration. Its exploitation pathway is through product development, providing immediate utility for cities and urban planners who use VC Map as a digital twin platform. Since it is part of a broader open-source framework, the Dynamic Layer Plugin is highly accessible and has significant potential for adoption.

Strengths include its smooth integration into the VC Map system and its capacity to enhance interaction with geospatial datasets. Weaknesses involve the complexity of data catalogues and a shift in standardisation, which could affect interoperability. Nonetheless, the plugin is valuable to a broad range of stakeholders, including policymakers, planners, and researchers.

The broader market includes similar GIS-based data integration tools. The primary user base comprises municipalities, environmental agencies, and NGOs involved in spatial planning.

The time to market was in 2025, as the plugin has already been released, is accessible via GitHub, and is integrated into the product delivered to customers. It is fully embedded within VCS's VC Map framework and will be maintained as part of the company's regular product development cycle. This outcome is regarded as a Key Exploitable Result.

2.1.11 ER11 – NBS Extensions for VC Planner

ER11 focuses on developing software extensions for the existing VC Planner tool, specifically designed to support the planning of NBS. These extensions include features such as the Growing Trees tool and Biotope Area Factor (BAF) calculation. The ownership of the resulting product belongs to VCS and relates to Tasks 4.1, 4.2, and 4.3. The TRL advances from 1 to 7 throughout the project.

This product development aims to support urban planning users who are already utilising the VC Map platform. The NBS extensions are designed to facilitate the integration of green infrastructure into urban regeneration processes. The expected method of exploitation is through product development and licensing, enhancing the capabilities and value of VC Planner.

The strength of this ER lies in its smooth integration with the VC Map and the increasing demand for urban NBS analysis tools. It is anticipated that cities already using VC Map will adopt these new functionalities. Nonetheless, a key weakness is the reliance on the availability and quality of tree data and models, which can differ across cities and countries.

Opportunities include the growing policy focus on urban greening and the integration of NBS within climate adaptation strategies. The tools could also be expanded to other planning sectors and contexts. No definite threats are identified, but the ongoing challenges of maintaining data quality and standardisation in evolving urban datasets remain.

The target market comprises local governments, municipal planners, environmental NGOs, and policymakers. Although potentially valuable, the partners do not regard this as a Key Exploitable Result.

2.1.12 ER12 – WMS-Time

ER12 introduces software support for time-dependent Web Map Service (WMS) layers in VC Map. This enhancement enables the visualisation of time series data, such as climate or weather projections, across different epochs or timeframes. Developed by VCS and associated with Tasks 4.1, 4.2, and 4.3, the ER starts at TRL 1 and is expected to reach TRL 8. The feature is integrated within the VC Map framework and addresses a growing demand for tools that support temporal visualisation of climate-related data in urban planning. It is beneficial for stakeholders needing dynamic visualisation capabilities, particularly in assessing long-term climate trends and simulations. Its main strength lies in its seamless integration into VC Map and its support for intuitive, time-based exploration of datasets. Like other tools in the VC ecosystem, it benefits from alignment with a broader suite of tools and user communities. The primary audience includes local authorities, planners, environmental analysts, and decision-makers requiring time-aware spatial insights. This ER is regarded as a key exploitable result due to its immediate usefulness, technical maturity, and alignment with the growing importance of climate data in decision-making.

2.1.13 ER13 – NBS Registry

The NBS Registry is an interface developed by ATC within URBREATH (linked to WP4/Task 4.4) that enables the visualisation, registration and monitoring of nature-based solutions across urban environments, progressing from TRL 6 to TRL 7. It supports decision-making by allowing municipalities, planners and NBS practitioners to track KPIs, compare interventions across cities and engage in data-driven governance. Its key strengths lie in its ability to catalogue diverse NBS projects, integrate environmental and socio-economic indicators, and offer flexible, cross-sectoral visualisation that improves transparency and planning effectiveness. Challenges include the need for continuous data updates, integration across heterogeneous city contexts and potentially high maintenance requirements, while competition from commercial dashboard platforms may also pose market barriers. Opportunities exist in linking the dashboard with AI, Machine Learning (ML) and Internet of Things (IoT) systems to provide advanced analytics, forecasting and sensor-driven monitoring, as well as scaling the registry into a broader European NBS knowledge base. Target users include municipalities, NGOs, urban planners and researchers, and the tool is intended to be incorporated into ATC's service and research portfolio. The NBS Registry is confirmed as a Key Exploitable Result.

2.1.14 ER14 – Dashboard Visualisation

ER14 refers to a dashboard interface that enables real-time visualisation of key metrics and indicators relevant to urban and environmental performance. The dashboard will be developed by ATC and connected to Task 4.4. It progresses from TRL 6 to TRL 7.

The visualisation dashboard offers high exploitation potential, especially in urban decision-making, data-driven governance, and cross-sectoral monitoring. It is a graphical interface that supports users by providing a snapshot of real-time data, thereby enhancing responsiveness and planning effectiveness. Its main strengths include the ability to track KPIs dynamically and adapt to multiple sectors, from urban development to environmental monitoring. However, it requires significant technical effort to stay updated and may incur high maintenance costs over time.

Opportunities exist in integrating the dashboard with AI, machine learning, and IoT devices to deliver more advanced analytics and predictive capabilities. Nonetheless, the tool may face stiff competition in a market already crowded with commercial dashboard solutions.

Target users include municipalities, NGOs, and policymakers. The result is expected to be incorporated into ATC's service and research portfolio. The ER is confirmed as a Key Exploitable Result, but it requires further investigation and additional discussion with the ER owner and contributors.

2.1.15 ER15 – Container UI

This result pertains to developing a unified Container UI, a centralised platform interface enabling users to access the full suite of URBREATH tools, including local digital twins, simulation models, stakeholder engagement tools, and dashboards. ATC is the developer of this platform, linked to Task 4.4. It starts at TRL 6 and is expected to reach TRL 7.

The Container UI is designed as a one-stop portal for stakeholders, unifying various functionalities into a single, cohesive user experience. This has strong potential for exploitation, as it simplifies access and reduces fragmentation in tool usage, a common issue in multi-partner digital projects.

Its main strength is serving as a central access point for all URBREATH digital components, enhancing usability and stakeholder engagement. However, it requires continual updates, maintenance, and technical support to stay operational and compatible with evolving tools. Deployment across different cities and governance systems may also introduce operational complexity.

Opportunities for expanding the platform include integrating predictive analytics, AI extensions, and scenario modelling tools, which could enhance its value for urban planners and policymakers. Threats could include operational complexity across cities that may limit adoption without robust support, though typical platform risks (security, scalability, interoperability) should be considered.

The primary market comprises urban planners, architects, and public authorities. ATC indicates that the Container UI will be integrated into its broader product development strategy. It is regarded as a Key Exploitable Result, highlighting its strategic importance in connecting and enabling other technical outputs of the project.

2.1.16 ER16 – KPI Manager

The KPI Manager is a software tool developed by ENG that enables the definition, management, and calculation of KPIs for monitoring urban environments. It is associated with Task 4.3, which begins at TRL 4 and reaches TRL 7 by the project's end. The tool is designed to support policymakers and decision-makers by offering a user-friendly interface for monitoring relevant environmental, social, or operational metrics without requiring advanced technical expertise or the involvement of data analysts. Its primary objective is to streamline access to actionable insights, thereby reducing the time and effort required to establish and maintain monitoring practices. Its strength lies in its simplicity and accessibility. It offers simplified KPI management in a format that is both practical and efficient. Despite this, some degree of user skill remains necessary for effective operation, which is acknowledged as a limitation, particularly for stakeholders with limited technical skills. Opportunities for exploitation include the tool's adaptability to sectors beyond smart cities or urban monitoring, potentially expanding to contexts such as health, energy, transportation, or education monitoring. A key threat is the limited financial resources in public institutions, which may hinder adoption, especially where additional investment in digital tools is required. No direct competitors are mentioned by ENG, but general competition in the form of other KPI monitoring software can be inferred. The target market consists of policymakers, urban planners, and public administration departments. ENG intends to include this tool in its Digital Enabler suite of services and products. It is considered a Key Exploitable Result, due to its cross-sectoral potential and relevance for evidence-based policymaking.

2.1.17ER17 – Online E-Participation Tool

ER17 is a web-based stakeholder engagement platform developed by ENG, designed to facilitate participatory processes initiated by municipalities. This tool connects with Task 4.2 and advances from TRL 3 to TRL 6. The platform offers functionalities designed to enhance stakeholder engagement through digital twin integration and data-driven interactions. It strives to improve communication between cities and stakeholders, promoting transparency and democratic participation, which is particularly important for cities adopting co-creation methodologies or inclusive urban planning. The integration of advanced technologies such as digital twins into a participatory platform is its main strength, offering users a unique and interactive environment to visualise and engage with urban data. Nevertheless, maintaining ongoing user engagement remains challenging, as effective participation often requires facilitation and incentives to encourage participation. Opportunities exist to adapt this platform across various domains, including environmental planning, health policy, and community development. However, budget constraints in the public sector and the proliferation of similar tools on the market may limit wider adoption. The submission by ENG mentions competing platforms, such as Consul, GoVocal, and PlaceSpeak, many of which offer open-source or licensed options. The primary audience includes policymakers, municipal authorities, and planners. It is expected that the platform will be integrated into ENG's Digital Enabler suite, contributing to the company's expanded service portfolio. It is clearly identified as a KER.

2.1.18 ER18 – AI Model for Flood Risk Assessment and Predictive Monitoring

Developed by EXUS and linked to Task 3.1, ER18 is an AI-based model designed to predict high water discharge rates and monitor flood risks. It starts at TRL 2 and aims to achieve TRL 5 during the project. The model generates outputs including flood probability data, water level forecasts, threshold alerts, and flood risk maps. It aims to enhance proactive flood management by local authorities, utility providers, and insurance firms, helping to lessen the impacts of extreme weather events. Its main strength is the integration of real-time alerts with predictive analytics, delivering timely information to minimise damage and improve public safety. However, its accuracy largely depends on the availability and quality of the data, a common challenge for data-intensive AI models. The demand for tools addressing climate-related risks, such as flooding, is rising, creating significant market potential. Nonetheless, competition from other predictive AI tools exists, especially if they are already integrated into existing platforms or benefit from public-sector mandates. Emerging data privacy and AI regulations may also influence the model's performance or the accessibility of datasets. The target market includes municipalities, utilities, emergency services, insurers, and policymakers. The model is expected to be adapted for integration into other EXUS products and is classified as a Key Exploitable Result due to its relevance and transferability across various flood risk management sectors.

2.1.19 ER19 – Visual Interpretable and Explainable AI (VIE-AI) Tool

ER19 is a software prototype developed by EXUS, designed to enhance the transparency and interpretability of complex AI models. It is part of Task 3.1 and progresses from TRL 5 to TRL 7.

This tool uses Explainable AI techniques to help users understand how and why AI systems make specific decisions. It offers visual explanations and transparent outputs, which are especially important in areas where accountability and trust in automated decision-making are crucial, such as public services or regulated sectors. Particularly, the VIE-AI tool complements and supports other AI tools (such as prediction and simulation models) by explaining their outputs, highlighting key drivers, and making complex results understandable for planners and decision-makers. This capability is essential to ensure responsible AI adoption, support informed urban decision-making, and foster confidence in the use of AI-driven insights across the URBREATH ecosystem.

Its main strength is in enhancing trust in AI by revealing its “black box” nature. The visual component enables both technical and non-technical users to engage meaningfully with algorithmic decisions. However, its efficacy depends on the quality and performance of the underlying AI models to which it is applied.

Market opportunities are significant, particularly in sectors such as finance, healthcare, urban governance, and environmental management, where explainability is not only beneficial but often essential. Threats include evolving regulations and the potential redundancy of such tools if they are integrated directly into next-generation AI platforms by larger competitors.

The target market includes public administrations, insurance companies, city authorities, utility providers, and any organisation deploying AI-driven services. EXUS regards it as a Key Exploitable Result, with potential for integration into existing and future product lines.

2.1.20 ER20 – Adaptive Rainfall-Infiltration Tracking

The Adaptive Rainfall-Infiltration Tracking is another AI model developed by EXUS, focused on predicting water infiltration rates in urban and peri-urban environments under varying soil and meteorological conditions. It is linked to Task 3.1, starting at TRL 1 and progressing to TRL 5. The model aims to assist local authorities and planners in anticipating infiltration issues and managing soil health more proactively. By simulating the impacts of land cover changes and weather events, the tool supports well-informed decisions on green infrastructure and NBS deployment. Its strength lies in its proactive approach to soil-water dynamics, which can be crucial for sustainable drainage and resilience planning. However, like other AI models in the URBREATH suite, it heavily depends on the availability of accurate input data, which may be limited in some regions. The increasing recognition of the importance of healthy soils in climate adaptation provides a strong rationale for the development of this tool. Nevertheless, competition from other predictive models and shifting regulatory environments may influence its long-term position. The target audience includes local authorities, land-use planners, municipalities, utilities, insurers, and policy makers. EXUS anticipates integrating the model into broader offerings. This ER is also regarded as a Key Exploitable Result, reflecting its alignment with emerging trends in urban resilience and land management.

2.1.21 ER21 – Shaded Area Calculation

This ER consists of a software extension for the VC Map platform, enabling users to calculate the percentage or absolute surface area (in square metres) of shaded and unshaded zones in an urban landscape. Developed and owned by VCS, it is linked to Tasks 4.1, 4.2, and 4.3. The tool advances from TRL 1 to TRL 7 during the project.

The exploitation strategy concentrates on feature or product development, mainly within the existing VC Map ecosystem. As demand rises for NBS analysis tools, especially for heat mitigation and urban comfort, this functionality is expected to be adopted by cities already utilising the VC Map.

The strength of the shaded area calculation lies in its integration with existing VCS tools, particularly the VC Map, enabling smooth adoption by current users.

The target market includes local authorities, municipalities, NGOs, and environmental policymakers. No discussion has yet taken place regarding time to market or return on investment. The tool is not considered a Key Exploitable Result.

2.1.22 ER22 – Snow pile Analysis

ER22 is a software module created by VCS that enables users to model and analyse snow accumulation (snow piles) and estimate melting volumes using current and forecasted weather conditions. FIC provides weather data projections, while the software is connected to Tasks 4.1, 4.2, and 4.4. It begins at TRL 1 and progresses to TRL 7.

This tool aims to enhance the VC Map platform's capabilities by modelling winter-related environmental processes. However, its potential for utilisation is considered limited, as snow pile melting analysis is not particularly relevant for most pilot or follower cities involved in URBREATH.

Although the exploitable result is technically new, it might be too limited in its applicability to attract widespread market interest. No explicit threats, competitors, or weaknesses are mentioned, although a "too simple" modelling approach is noted as a potential concern.

The tool may find niche applications in colder climates or high-latitude urban areas. The outcome is not recognised as a Key Exploitable Result.

2.1.23 ER23 – Waterflow Analysis

Waterflow analysis is an extension of the VC Map platform, designed to analyse terrain and simulate water flow patterns using raster or GeoJSON outputs. Developed by VCS, it is linked to Tasks 4.1, 4.2, and 4.5. The TRL progresses from 1 to 7. As with ER21, this tool aims to support NBS-related planning and hydrological simulation. It is regarded as having high exploitation potential, especially given the growing need for stormwater management tools in urban planning. It integrates seamlessly with VC Map and is likely to be valid for cities utilising this 3D viewer platform. No explicit weaknesses or threats are mentioned by VCS, although a brief note is made about the potential oversimplification of the modelling approach. The target market comprises municipalities, urban planners, and environmental organisations. The result is not designated as a Key Exploitable Result, but its utility within the VC Map ecosystem is recognised.

2.1.24ER24 – GeoCacher

GeoCacher is a software tool developed by ENG to assist non-technical users in performing geospatial queries on NGSI-LD (Next Generation Service Interfaces – Linked Data) entities. It features a web User Interface (UI) that simplifies the creation, updating, and publishing of georeferenced data layers, with the option to share them as open data in the URBREATH catalogue via Idras open-source data catalogue platform. It is connected to Task 3.6 and advances from TRL 4 to 6.

The tool serves as a user-friendly solution for working with geospatial datasets, supporting both data exploration and public dissemination. Its main strength is its integration with the Context Broker (NGSI-LD) and compatibility with Idras. Plans are in place to extend integration with other services, such as GeoServer and GeoNetwork, which would enhance data interoperability and platform flexibility.

Although specific exploitation challenges, such as competition or adoption issues, are not detailed, its features regarding integration and interoperability suggest a strategic option for cities and public authorities aiming to improve access to open geodata.

The main users include local governments, environmental agencies, and policymakers. The tool is intended to be integrated into the ENG Digital Enabler suite. While not explicitly listed as a Key Exploitable Result, it has potential for wider adoption within data-sharing ecosystems.

2.1.25 ER25 – E-Participation Mobile Application

This ER overlaps with ER2 and ER4 and comprises a native smartphone application developed by TEL for civic engagement, stakeholder interaction, and city-wide communication. The tool supports both Android and iOS platforms and is linked to Task 4.2. It progresses from TRL 4 to TRL 6 during the project. Its exploitation value lies in consolidating various participatory functions—currently scattered across different standalone apps—into a single adaptable and feature-rich mobile platform. Strengths include its scalability, usability, and potential for market differentiation through custom feature development tailored to each municipality’s needs. Challenges involve integration difficulties with existing apps or databases and adapting web-based features for mobile environments. Additionally, a lack of systematic feedback mechanisms by public authorities and budget constraints may hinder adoption. Competition includes platforms like YourPriorities, Decidim, Consul, and GoVocal—many of which offer open-source options. The target market encompasses local governments, NGOs, and public policy agencies. The app is intended to become part of TEL’s service offering. It is recognised as a Key Exploitable Result, especially in relation to ER2 and ER4, reinforcing its strategic role within the URBREATH architecture.

2.1.26 ER26 – Plan of Works Framework for Monitoring Innovation Pilots in Multiple Locations

ER26 is a methodological framework adapted by TAL for monitoring innovation activities across multiple urban demonstration sites. It expands on the RIBA (Royal Institute of British Architects) Plan of Works and is linked to Task 6.1. The TRL advances from 5 to 7. The framework aims to provide structured oversight of innovation efforts within real-world urban pilot projects, ensuring that creation, deployment, and evaluation are synchronised. This cross-disciplinary transfer of methodology from architecture to innovation management is one of its most distinctive features. Its main strength is its potential to standardise innovation pilot monitoring across diverse regions and thematic areas. However, the novelty of applying RIBA methods to other domains may pose challenges for adaptation. The framework needs further testing in different sectors to confirm its scalability. Opportunities exist in aligning with Horizon Europe Innovation Actions & Research and Innovation Actions that involve complex demonstration and deployment elements. While no direct competitors or risks are explicitly mentioned, other frameworks for innovation monitoring could serve as indirect competition. The primary audience includes innovation managers, municipalities, and EU-funded project coordinators involved in real-world pilot testing. Despite its usefulness, partners do not regard this as a Key Exploitable Result.

2.2 Description of the assessment procedure to define the final list of Key Exploitable Results

The identification and selection of Key Exploitable Results (KERs) within URBREATH follows a structured and transparent evaluation process, designed to prioritise project outcomes with the highest potential for downstream exploitation, whether commercial, policy-driven, or societal. The assessment is conducted individually by each project partner, based on a uniform scoring framework, ensuring comparability, fairness, and strategic alignment with the objectives of Horizon Europe.

Definition of KERs

A Key Exploitable Result (KER) refers to a primary outcome of the project that demonstrates high potential for exploitation beyond the project's lifetime. It may translate into a product, process, service, or methodology, and can generate added value through commercialisation, public policy adoption, societal uptake, further research or educational use. As defined by the Horizon Results Platform, a KER must be identifiable, prioritised, and selected due to its capacity to generate measurable impact.

Step-by-Step Evaluation Process

1. Partner-Level Evaluation

Each project partner evaluates the ERs to which they have contributed, using a standard evaluation form and rating scale.

2. Scoring Criteria

Each ER is assessed against **three core criteria**, using a numeric scale from **1 (lowest)** to **10 (highest)**:

- **Innovation**
Measures the novelty of the result. High scores reflect new or breakthrough ideas, technologies, or methodologies that surpass the current state of the art. Innovation may include patentable inventions or disruptive approaches.
- **Exploitability**
Assesses the practical potential of the result. High scores are assigned to ERs that can be effectively transformed into viable products, services, tools, processes, or regulatory instruments. This includes consideration of market readiness, scalability, and IP status.
- **Impact**
Captures the expected positive effects of the result. This includes societal benefits, contribution to policy agendas, environmental sustainability, economic value generation, or scientific advancement. Impact is evaluated in both short- and long-term contexts.

3. Calculation of Averages

For each ER:

- The **average score** is calculated separately for each of the three criteria across all partner evaluations.
- A **final KER score** is derived by averaging the three criterion-specific averages.
(Final Score = (Innovation avg + Exploitability avg + Impact avg) / 3)

4. Prioritisation

Results with the **highest final scores** are flagged as Key Exploitable Results. This prioritisation ensures that the most promising and valuable ERs are highlighted for dedicated exploitation planning.

This scoring and assessment method guarantees an evidence-based and partner-driven approach to identifying the most promising innovations created by URBREATH. It aligns with the European Commission's emphasis on impact and valorisation, ensuring that the project's outputs are not only technically excellent but also practical, beneficial, and influential in real-world settings. The final set of KERs forms the foundation for developing customised exploitation strategies, market alignment, IP protection, and stakeholder engagement.

3 Individual and Joint Exploitation Plans

Methodology of Individual and Joint Exploitation Plans

The methodology employed for developing Individual and Joint Exploitation Plans in the URBREATH project has been designed to reflect the project's emphasis on real-world impact, replicability, and the sustainability of results beyond the project's lifetime. The exploitation planning process has been guided by a structured, participatory, and phased approach aligned with Task 8.4 and the broader exploitation roadmap detailed in the Grant Agreement.

Structure of the Exploitation Planning Process

All partners were invited to develop their exploitation intentions based on a standard methodology that distinguishes between individual exploitation (organisation-specific) and joint exploitation (collaborative use of shared outputs). Each exploitation plan was built around six methodological pillars:

- **Identification of Results:** Partners were required to specify which project outputs (technical tools, frameworks, knowledge products, data services, or methodologies) they plan to exploit. These outputs were linked to the project's Key Exploitable Results (KERs), ranging from digital twins and NBS registries to AI tools and co-creation frameworks.
- **Exploitation Strategy:** Three main routes were considered:
 - *Commercial exploitation* (products, services, tools, IP),
 - *Academic exploitation* (research, teaching, dissemination), and
 - *Internal use* (integration into institutional workflows or future projects).
- **Expected Impact:** Each plan assessed the potential effect of exploitation activities across economic, societal, environmental, academic or organisational dimensions.
- **Timeline and Milestones:** A clear exploitation roadmap was requested, identifying key post-project actions, alignment with market or policy cycles, and critical uptake windows (e.g. Mission Cities replication, municipal planning cycles).
- **Resources and Capabilities:** Partners detailed the internal capacities (staff, expertise, infrastructure) and external resources (funding, partnerships, networks) that would enable the execution of their plans.
- **Collaboration Potential:** In the case of joint exploitation, additional dimensions were assessed: governance of joint activities, IPR arrangements, complementarity of assets, and risk mitigation strategies.

This methodological template was communicated through guidance notes and workshops, serving to align exploitation thinking across different types of partners (e.g., technology providers, cities, academic institutions, SMEs, NGOs), while allowing flexibility in terms of depth, focus, and ambition depending on the profile and capacity of each organisation.

Analytical Summary of Exploitation Plans and Main Conclusions

A total of 37 partners provided individual and/or joint exploitation plans, spanning public authorities, academic institutions, research centres, private enterprises, and civil society actors. Their responses

exhibit high diversity in both the form and function of exploitation, but also reveal several key trends and cross-cutting conclusions:

1. Strong Academic and Methodological Uptake

Many partners, particularly universities (e.g., POLIMI, TAL, ICCS, UPM) and research institutes (e.g., Fraunhofer, FIC), focus on exploiting project results through scientific dissemination, integration into teaching curricula, expansion of their research portfolios, and preparation of future Horizon Europe proposals. Methodologies related to NBS evaluation, co-creation, and planning frameworks are core to this academic exploitation. For example, the "Plan of Works" methodology (TAL) – a framework adapted from the RIBA Plan of Work that visually aligns tasks and pilot phases on a shared timeline – and the NBS evidence-based impact framework (KAMK, USTUTT) are being absorbed into institutional research programmes and doctoral research.

2. Commercial Exploitation through Digital and Data-Driven Tools

A substantial number of technology-oriented partners (ENG, VCS, LAT40, DEDA, TEL, EXUS, FIC, Municipia, ATC) propose to commercialise tools developed in URBREATH, such as:

- Digital Twins and plugins (VCS, Kajaani, Aarhus)
- E-participation apps and dashboards (TEL, ENG, Municipia)
- AI-based predictive tools (EXUS, FIC)
- Geospatial and satellite-based monitoring platforms (LAT40)

The commercial strategies range from SaaS models and API access to licensing, white-labelling, and integration with existing corporate product suites. Several actors also identify smart cities markets, local governments, and urban planners as key target clients. The open-source nature of some outputs (e.g., VC Map plugins, Decidim-based tools) facilitates future adaptation and interoperability.

3. Institutionalisation of Results in Public Authorities

Cities (e.g. Madrid, Cluj-Napoca, Athens, Aarhus, Pilsen, Kajaani) demonstrate commitment to embedding URBREATH outputs into their strategic urban planning processes, digital governance ecosystems, and climate adaptation strategies. These include:

- Using digital tools for participatory planning
- Incorporating URBREATH approaches into climate neutrality roadmaps
- Creating Living Labs as continuous innovation spaces
- Deploying adaptive planning and procurement pathways

This confirms URBREATH's relevance to operational urban governance and suggests a high likelihood of policy-level impact and institutional learning.

4. High Value in Joint Exploitation and Strategic Alliances

Multiple plans point to consolidated joint exploitation pathways, particularly:

- Tool co-development and integration: e.g., ICCS & DEDA on mobility tools, VITO with VCS & ENG on digital twin infrastructure.

- Mission Cities replication channels: especially UPM and Madrid, leveraging the citiES2030 platform and NetZeroCities repository.
- Knowledge platforms and labs: e.g., Lisbon Council's Sustainable Cities Lab, or BLOXHUB's ecosystem-wide knowledge integration.

These collaborations ensure that URBREATH results are not fragmented, but instead re-combined, scaled and transferred into broader EU initiatives and innovation pipelines.

5. Emphasis on Societal and Behavioural Impact

Several partners, especially from the civil society and consultancy sectors (URBASOFIA, TRAZA, BASURAMA, DBC, CA), emphasise the social value of URBREATH: the empowerment of local communities, increased stakeholder participation, and the visibility of nature-based, inclusive urban transformation. Many plan to utilise co-creation methodologies, capacity-building materials, or policy frameworks in future regional and EU-funded projects.

6. Timing and Maturity

Across the plans, exploitation activities are generally timed to begin after the main implementation of the NBS and tools in the Front-Runner Cities (2026–2027), aligned with key milestones such as:

- URBAN-FLOW implementation (Lisbon Council, 2026)
- Platform validation and commercialisation (TEL, ENG, EXUS)
- Municipal replication strategies (Madrid, Cluj, Athens)
- Integration into Horizon Mission structures (UPM, DML)

The Technology Readiness Levels (TRLs) of key outputs vary. However, most are expected to reach TRL 6–7 by the project's end, with some already validated at TRL 8 (e.g., FICLIMA's climate projections), which supports their exploitation potential.

Main Conclusions

- The methodological coherence of the individual and joint plans demonstrates that partners understood and followed a common exploitation logic, allowing comparability and alignment.
- The results reveal rich diversity of exploitation routes, ranging from commercial and academic to public-sector uptake, suggesting a robust foundation for long-term impact.
- A major strength lies in the synergistic use of tools and methods, fostering joint exploitation clusters that add value beyond what each partner could achieve individually.
- The involvement of mission-oriented platforms (NZC, citiES2030) and strong policy linkages indicate that URBREATH is positioned not only as a research project but as a strategic enabler of urban climate transitions.
- Exploitation is not limited to product-level outputs, but also includes procedural, methodological and governance innovations, especially in cities, which increases the replicability and systemic relevance of the project.
- Finally, there is strong ownership across partner types, ensuring that the project's legacy will be sustained through real-world applications, research continuity, policy integration, and market-driven solutions.

3.1 LC – THE LISBON COUNCIL FOR ECONOMIC COMPETITIVENESS ASBL

The Lisbon Council's exploitation of the URBREATH project establishes a foundation that supports long-term research capacity. URBREATH provided the necessary experience for this expansion in urban sustainability research and steering.

Exploitation focuses on validating the URBREATH framework and scaling it up for use in new projects. Specifically, the framework, comprising methodologies, co-creation models, and a partner network, was leveraged to provide the intellectual foundation for the BLOSSOM project (<https://blossom-project.eu/>), ensuring seamless thematic continuity. The URBREATH principles then led directly to the URBAN-FLOW project, which expands URBREATH's pilot concepts by driving real-time, evidence-based decisions in European cities.

Expected Impact: The exploitation of the URBREATH Framework has created a continuous stream of work. BLOSSOM specifically exploits the network and methodologies to bridge the gap between public authorities and private financial actors, accelerating transformative climate adaptation and mitigation solutions through Living Labs and innovative financing schemes. This is compounded by the scale of URBAN-FLOW, which institutionalises the use of Local Digital Twins and Mobility Data Spaces. The URBAN-FLOW project scope—demonstrations in three leading cities (Valencia, Florence, Tampere) and replication in three others (Edinburgh, Brussels, Pilsen) shows the broad societal impact launched from the URBREATH foundation. Key milestones include the achieved BLOSSOM project launch (June 2025), and the January 2026 official launch and implementation start of the URBAN-FLOW project.

The second exploitation area is the establishment of expertise via the Sustainable Cities Lab. This action aims to establish a permanent laboratory for applying the gained knowledge to accelerate climate-positive, liveable, and inclusive urban transitions. This internal research hub is being developed to formalise and consolidate research insights and evidence derived from URBREATH and its follow-on projects. The Lab will provide a consistent mechanism for generating evidence-based policy advice and convening through high-level summits and policy roundtables, focusing on challenges such as climate change, with a particular emphasis on accelerating the adoption of urban and NBS for resilience and sustainability.

The establishment of the Lab ensures a steady output of evidence-based advisory work, embedding URBREATH's research legacy in European policy dialogue. The timeline milestone includes the Q1 2026 goal for the official launch of the Sustainable Cities Lab, which will coordinate its first internal synergy among the URBREATH, BLOSSOM and URBAN-FLOW teams.

Synthesis: By leveraging the initial framework into the large-scale BLOSSOM and URBAN-FLOW projects and simultaneously establishing the permanent Sustainable Cities Lab, the Lisbon Council ensures that the project's knowledge, networks, and methodologies will continue to drive policy dialogue and actionable insights for climate-neutral, resilient European cities.

3.2 POLIMI – POLITECNICO DI MILANO

POLIMI's main exploitable results include the overall URBREATH methodology, as documented in Deliverables D2.1, D2.2 and D2.3. This methodology defines workstreams, tools and methods that can

be applied in different contexts and for different purposes. It can support a heterogeneous portfolio of projects working in close collaboration with cities (cf. WP2).

In addition, POLIMI contributes to exploitable knowledge on public procurement models for NBS deployment in different contexts. This work can serve as a basis for better understanding how, and which types of, procurement inputs and contractual arrangements are required to secure the long-term development, implementation and maintenance of NBS. This is particularly relevant for the Follower Cities (cf. D7.3 and D7.4) with respect to planning, and for the Front-Runner Cities (cf. D6.7 and D6.8) with respect to implementation.

Individual exploitation: POLIMI will exploit and disseminate the overall methodology, which can be used, in whole or in part, to replicate similar processes and outcomes following the URBREATH methods and approach. POLIMI will also exploit and further develop the methodology's organisational dimension, including cross-WP collaboration mechanisms and multi-scale working practices.

Expected impact: The generated knowledge will be exploited through multiple dissemination and exploitation channels, including academic publications and conferences, city-focused events, and professional and thematic networking activities.

3.3 FRAUNHOFER – FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V.

Fraunhofer's exploitation of the URBREATH project lies in advancing its research and consultancy services related to urban sustainability and climate adaptation ("Morgenstadt" (City of Tomorrow) Framework). Fraunhofer integrates project results into its "Morgenstadt" framework to improve its research and advisory services for public authorities, rather than pursuing commercial interests.

Individual Exploitation: Fraunhofer's individual exploitation focuses on enhancing its scientific knowledge in climate-neutral urban planning. Fraunhofer integrates insights from project tasks (specifically T2.2, T5.6, T7.1, T7.6) into its existing portfolio. This enhances its capabilities for assessing and planning NBS. This work supports Fraunhofer's non-profit mission. It provides a basis for future research funding and continues to serve as a public-good advisory role for EU cities.

Joint Exploitation: Fraunhofer's joint exploitation activities centre on dissemination and capacity building with partners. Fraunhofer works with POLIMI, VLO, and the city partners to promote the project's methodological framework (D2.1, D2.2, D2.3) as a best-practice model through publications, workshops, and the "Morgenstadt" network. NBS Performance Evaluation (T5.6) and Adaptive Plans (T2.2), Fraunhofer collaborates with technical partners, such as VITO and ICCS, to refine these assessment tools for use in future research and consultancy. Fraunhofer leads the promotion of the "European Nature-Based Solutions Manager Certification" (D7.2) to build capacity for public administrators and establish a new standard for expertise in sustainable urban development.

3.4 TAL – TALLINNA TEHNIKAÜLIKOOL

Tallinn University of Technology (TAL) will exploit the project results to enhance the scientific and application impact.

Individual exploitation: The main exploitable result that will be further developed, is the use of "Plan of Work" methodology, based on RIBA planning framework. This methodology is tested during URBREATH to monitor the piloting activities and innovation testing across multiple piloting locations. The created methodology establishes a visual framework that aligns different tasks and pilot operational phases on a single timeline. Thus, enabling us to understand how well different project activities and tasks are aligned. This framework helps to make necessary adjustments and manage risks, strongly supporting innovation testing.

Expected impact: Valuable knowledge to be used in the upcoming international innovation projects. This result supports TAL's involvement in extensive international research and innovation projects and pilot. TAL will also translate the results into scientific dissemination (conference presentations, scientific papers).

3.5 ICCS – EREVNITIKO PANEPISTIMIAKO INSTITOUTO SYSTIMATON EPIKOINONION KAI YPOLOGISTON

ICCS will exploit the results of its work in URBREATH through the further academic development and dissemination of four data-driven urban analytics tools: the 15-Minute City Tool, the Public Transport Accessibility Tool, the Crime Prediction Tool, and the Snow Deposit Optimisation Tool. These tools support the development of more sustainable, accessible, and resilient cities through evidence-based planning and spatial analysis. The exploitation strategy is primarily academic, focusing on scientific publications, conference presentations, and use in future research proposals under Horizon Europe and national funding schemes. Internally, ICCS will also employ the developed algorithms and methodologies to enrich its modelling capabilities in spatial analytics and transport systems research. Jointly with DEDA, ICCS will further develop and pilot the 15-Minute City and Public Transport Accessibility tools as part of a joint effort to create a shared platform for assessing urban mobility and access to services in pilot cities. This collaboration will include refining the tools, validating them with local data, and organising pilot demonstrations by mid-2026. The expected impact is to provide municipalities with practical tools for data-driven decision-making, enhance collaboration between researchers and local authorities, and promote the broader adoption of spatial analysis methods in urban planning.

3.6 VITO – VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V.

The work conducted under Task 3.4 will generate a suite of exploitable results, including high-resolution numerical modelling tools and NBS-specific sub-models linked to digital twin infrastructures. VITO will integrate the developed modelling workflows and data processing methods into its urban environmental analysis services, improving predictive capabilities for sustainable city planning.

Furthermore, the work VITO performed to integrate their models into the Digital Twin will enable the exploitation of these models in future projects as well (individual exploitation). Indeed, the API-fication of some models decouples the calculation procedures from specific front-end implementations, often tailor-made for certain end-users. As a result, VITO foresees being able to offer its modelling expertise much more easily to future partners and applications beyond this project.

Expected impact: It will facilitate replicability across European cities, providing a technical foundation for municipalities, planners, and policy makers to assess and compare the efficiency of NBS under different conditions. VITO also foresees that the other partners will collaborate on joint dissemination actions (e.g., open-access publications, workshops, conference presentations) (Joint Exploitation). In terms of timeline, individual exploitation activities will start towards the end of the modelling phase (M36–M40), focusing on internal integration and publication.

3.7 UPM – UNIVERSIDAD POLITECNICA DE MADRID

The Universidad Politécnica de Madrid (UPM), through the Innovation and Technology for Development Centre (itdUPM), will leverage the URBREATH results both individually and in collaboration with project partners to maximise scientific, societal and operational impact.

Individual Exploitation: UPM will build upon the project’s methodologies, digital tools, and participatory frameworks to strengthen its research and educational programs in climate-neutral urban transformation. The results will feed into academic outputs (peer-reviewed publications, doctoral research, and teaching materials) and institutional innovation practices in urban experimentation. Methodological frameworks such as co-creation processes, systemic portfolio management, and governance models will be integrated into ongoing collaborations with cities. Milestones include the publication of scientific papers (2024–2027) and dissemination through open-access repositories.

Joint Exploitation: As a partner of NetZeroCities (NZN)—the flagship initiative supporting the EU Mission on Climate-Neutral and Smart Cities—UPM will ensure the effective transfer and scaling of URBREATH results and lessons learned from the Madrid pilot to other Mission Cities across Europe. This will be achieved through two complementary pathways:

- 1) the Spanish Cities Platform citiES2030, which coordinates the national cluster of Mission Cities and facilitates multi-level collaboration among municipalities, academia, and national agencies; and
- 2) the NZC knowledge and replication repository, which enables peer-to-peer learning and portfolio-based knowledge transfer across the European Mission network. Through these mechanisms, UPM will contribute to the mainstreaming of URBREATH’s systemic, participatory, and nature-based approaches within Mission Cities’ transition portfolios.

The joint exploitation will foster cross-city capacity building, replication and institutional innovation towards climate neutrality. Key milestones include the alignment of URBREATH outcomes with NZC replication activities (2026) and their dissemination and uptake across the Mission network (2027).

3.8 KAMK – KAJAANIN AMMATTIKORKEAKOULU OY

The key exploitable results for KAMK include:

NBS Evidence-Based Impact Assessment and Evaluation Framework (ER7): KAMK can apply this framework in future regional and international projects, particularly those focused on climate resilience and nature-based solutions. The framework supports municipalities and regional actors in evaluating the impacts of NBS interventions, enabling strategic planning and policy development.

NBS Registry (ER13): The registry can support KAMK's training and consultancy services by providing a structured, comparable database for documenting and sharing nature-based solutions.

KPI Manager (ER16): This tool can be incorporated into KAMK's internal and external evaluation processes, especially in projects related to the circular economy and sustainable development. It enables data-driven monitoring and impact assessment across various contexts.

KAMK plans to integrate these tools and methodologies into its education, research, and regional development activities. They will be offered to municipalities, companies, and other stakeholders through consultancy and capacity-building initiatives.

3.9 VLO – VLAAMSE GEWEST

For VLO, the exploitation of the URBREATH project is in supporting the consortium with its specific expertise, including:

- Workshop-based step-by-step functional analysis (in support of the URBREATH pilot cities, WP2, 3 and 4). By using case definitions, mind mapping, defining local epics (high-level user stories) and requirements, validation, and prioritisation.
- The translation to technical solutions and support of the road to tool and model development (in support of WP3-4) is part of the toolbox.
- The design of Local Living Labs (LLs), their local set-up, and implementation. Designing Local Living Labs (LLs), including their local set-up and implementation, with a strong focus on co-creation in NBS design, implementation and monitoring. This includes: (a) Setting up an overarching LL framework, (b) Organising workshops to define LL roles and tasks (LL, consortium, local partners), conduct stakeholder mapping and agree ambition levels, (c) Organising train-the-trainer sessions, and (d) Providing dedicated pilot support and convening pilot-centric meetings to exchange ideas, challenges and obstacles.
- The support of other WP5 tasks concerns data and infrastructure gap analyses, local implementation and customisation of tools and models, capacity building and training, the setup of an urban planning workflow (T5.4), KPI definition (preparation of the KPI framework, T5.6), and the establishment of interactive dashboards and decision support systems (T5.5).
- As a local partner of the city of Leuven, VLO supports the LLs, tool developments, and NBS analyses of the city.

3.10 ENG – ENGINEERING - INGEGNERIA INFORMATICA SPA

As a global IT player in the digital transformation sector, aiming to deliver innovative solutions and strategic consultancy to several vertical markets, including the Public Administration sector, ENG will primarily utilise the URBREATH results to enhance its current offerings dedicated to cities and citizens, particularly in urban planning. In particular, the URBREATH project represents a relevant opportunity (1) to enhance its knowledge (in terms of needs, barriers, opportunities, lessons learned) regarding the use of specific technologies and methodologies in the context of urban planning, as well as (2) to strengthen its capabilities of providing innovative ICT solutions to its public administration customers to enable them in leveraging data, advanced analytics and co-creation processes to deliver better public value.

Focusing on four main technical assets (the URBREATH Catalogue, E-Participation Web Application, GeoCacher, and KPI-Manager), ENG will utilise them in other ongoing and future projects, as well as to strengthen the market offer for local administrations, leveraging their open-source distributions. In particular, the E-Participation Web Application, based on Decidim, enables new scenarios and opportunities, thanks to Decidim’s well-established presence at the municipal level in the EU, and assures no vendor lock-in risk.

ENG will also share URBREATH results, competencies, and experiences with ENG Business Units, thereby strengthening the company’s capabilities in providing innovative services to its public administration customers.

3.11 DEDA – DEDA NEXT SRL

As an innovation-driven company specialised in urban data analytics and geospatial technologies, DEDA Next will exploit the URBREATH results to enhance its technological assets and strengthen its role in supporting sustainable and climate-resilient urban planning.

DEDA Next’s primary focus is on the 15-Minute Index, which operationalises the “15-minute city” concept. The integration leverages open baseline versions of tools embedded within the URBREATH digital platform as well as proprietary advanced versions (with orography integration and tiling) maintained by DEDA Next for large-scale and commercial applications.

DEDA Next provided an open-source algorithm for collaborative improvement with ICCS, aiming to integrate it into the URBREATH platform and support dynamic, user-driven simulations.

Beyond this, DEDA Next’s exploitation plan promotes strong collaboration with other URBREATH partners who contribute complementary technologies, such as VITO’s 3-30-300 modelling and ENG/VCS’s digital twin solutions. Through joint development, shared-use agreements, and system interoperability, DEDA Next aims to deliver integrated urban analysis platforms and services, consolidating multiple URBREATH outputs into robust and scalable market offerings.

From an economic perspective, the strategy reinforces DEDA Next's market position and diversifies its service portfolio. Socially, it promotes inclusive, evidence-based urban regeneration aligned with European climate goals. Organisationally, it strengthens technical and analytical competencies.

DEDA Next's exploitation plan utilises URBREATH's frameworks to deliver scalable, interoperable digital solutions that support the project's and the EU's climate resilience goals.

3.12 ATC – ATHENS TECHNOLOGY CENTER ANONYMI VIOMICHANIKI EMPORIKI KAI TECHNIKI ETAIREIA EFARMOGON YPSILIS TECHNOLOGIAS

ATC, as one of the leading technological partners in the URBREATH project, plays a crucial role in the development and future utilisation of the project's digital tools. The company has been responsible for implementing two key components: the UI Toolbox and the NBS Registry, which together form the backbone of URBREATH's data management and decision-support system. Through these tools, ATC contributes to improving the monitoring, analysis and visualisation of data related to urban sustainability and nature-based solutions. In terms of exploitation, ATC aims to build on these results by further developing both tools into operational solutions that can be used by cities, research organisations, and other stakeholders working on climate adaptation and resilience.

ATC plans to continue refining the UI into a flexible and user-friendly platform that supports data-driven decision-making for urban planning and environmental monitoring. The NBS Registry will be further developed as a digital reference point for recording, evaluating, and sharing nature-based and hybrid solutions across different contexts. These tools will help municipalities and other users to access reliable information, assess impacts, and plan effective interventions. Through its participation in URBREATH, ATC strengthens its expertise in smart city technologies, data integration, and environmental analytics. The company intends to leverage this experience to expand its portfolio and support clients in both the public and private sectors who seek practical, technology-based approaches to sustainable urban development.

3.13 VCS – VIRTUALCITYSYSTEMS GMBH

VCS, as a technological partner in the URBREATH project, plays a key role in the development, integration, and long-term maintenance of the local digital twin tools. The company's main contributions focus on enhancing the VC Map viewer and its associated applications, which form an essential part of URBREATH's digital ecosystem for urban sustainability and NBS.

Through these developments, VCS strengthens the analytical, visualisation and planning capabilities of the VC Map platform, enabling cities, planners and researchers to interactively explore, assess and communicate data related to climate adaptation and resilience. Three exploitable software results have been developed as part of this effort:

- ER10 – Dynamic Layer Plugin: This plugin extends the VC Map by allowing users to dynamically add service data from URLs or catalogues directly into the viewer. It supports seamless integration with external data sources, improving flexibility and interoperability in data-driven urban analysis. The tool is open-source and available via the VC Map framework on GitHub (<https://github.com/virtualcitySYSTEMS/map-dynamic-layer>), ensuring ongoing maintenance

and updates based on user feedback. Given the increasing demand for urban NBS analysis tools, this feature is expected to see high adoption among cities and institutions using VC Map.

- **ER11 – NBS Extensions for VC Planner:** This extension expands the VC Planner with new modules supporting the design and evaluation of nature-based solutions. It incorporates dedicated tools such as GrowingTrees and BAF calculation, allowing users to assess the ecological and spatial impacts of NBS interventions. These capabilities will support municipalities, policymakers, and environmental planners in creating greener and more resilient urban environments.
- **ER12 – WMS-Time:** This feature adds support for time-dependent WMS layers in VC Map, enabling users to visualise temporal data such as weather and climate projections across different time periods. The functionality significantly enhances the viewer’s analytical scope, making it a valuable resource for monitoring climate trends and assessing long-term environmental changes.

Together, these exploitable results enhance the VC Map ecosystem into a robust, modular and user-oriented platform for sustainable urban management. VCS plans to continue maintaining and expanding these components as part of its core product portfolio, ensuring long-term usability, compatibility with emerging standards, and responsiveness to stakeholder needs.

Through its participation in URBREATH, VCS further consolidates its expertise in 3D city modelling, geospatial data integration, and environmental analytics—positioning the company to support both public and private sector clients in advancing data-driven, technology-based approaches to sustainable urban development.

3.14 URB – URBASOFIA SRL

Individual Exploitation Plan Methodology

Identify Results: The primary objectives are to enhance biodiversity, minimise air and noise pollution, and mitigate the urban heat island effect— all through the active participation of relevant stakeholders. The proposed solutions and methodologies focus on interventions at selected green sites along the Someş River to advance the development of a blue-green corridor and to raise awareness of the importance of ecological community spaces in the city.

URB also aim to promote public participation, encourage the use of digital tools within ecological communities, and enrich the city’s existing green spaces and green infrastructure.

Exploitation Strategy:

- **Academic Exploitation:** Contribute to further research, education, and publications. Project outcomes will be continuously shared with the Cluj Metropolitan Area Intercommunal Development Association, which has established an Urban–Rural hub to transfer best practices, including green urban regeneration, from the core city to peri-urban localities along the Someş axis (an approximately 75 km long corridor).
- **Internal Use:** Apply the results for practical purposes, enriching our internal databases and disseminating models and good practices in green urban regeneration. The project will serve as a reference model for future initiatives in green transitions and ecological restoration.

- **Expected Impact:** By integrating digital tools, planting and living labs, the project will provide a best-practice example in Romania for shaping urban green landscapes and improving quality of life in the urban environment.

Timeline and Milestones: URB began supporting the Cluj living labs in October 2024, enhancing public participation and co-creation processes. These activities inform the planting plans scheduled for implementation in November 2025. Digital measurements using air sensors started in September 2025 and will support the evaluation of the planning strategy. In March–April 2026, URB will support Cluj in preparing plans for installing urban furniture, information panels and pergolas.

Resources and Capabilities: The project draws on human, financial, and technological resources aligned with the overall implementation plan. URB has initiated collaboration with the University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca and the Romanian Ornithological Association to develop planting plans and design proposals, and has carried out multiple public participation actions throughout the project. URB considers human resources to be the most valuable and diverse assets for successful implementation.

Joint Exploitation Plan Methodology

Identify Joint Results: The living labs, design plans, and habitat research are the activities that have benefited most from the combined expertise of the participating teams.

3.15 DBC – DIADIKASIA BUSINESS CONSULTING SYMVOULOI EPICHEIRISEON AE

Diadikasia Business Consulting (DBC), as a beneficiary of the URBREATH project, plays a crucial role in the consortium's exploitation activities. DBC leads Task 8.4, which focuses on the overall exploitation and commercialisation strategy of the project, and coordinates the delivery of the Exploitation and Business Plan, created in four versions over the project's lifecycle. DBC's work aims to ensure long-term sustainability and practical application of URBREATH results. Its focus is on identifying Key Exploitable Results (KERs), developing business models, facilitating stakeholder engagement, and creating scenarios for replication and adaptation. By leading these activities, DBC aims to integrate knowledge and methods into its consulting practice, particularly in stakeholder engagement, impact assessment, policy planning and sustainable urban development. The company plans to leverage the project's output by expanding its service offerings to public and private clients, particularly those involved in local and regional climate neutrality and resilience strategies. Through its participation, DBC expects to gain valuable experience, expand its market presence, and increase its involvement in EU-funded projects. The final phases of the project, especially the exploitation workshop scheduled around month 40, will be crucial for validating the developed roadmaps and identifying target users. DBC's long-term goal is to utilise the tools, methodologies, and strategic frameworks developed in URBREATH to support cities, public bodies and other stakeholders in planning, financing and implementing nature-based and hybrid climate solutions.

3.16 LAT – LATITUDO 40 SRL

Latitudo 40 will exploit three specific URBREATH results aligned with its commercial geospatial intelligence offerings. First, ER3, an innovative simulation model for urban regeneration and climate neutrality co-developed with VITO and DEDA, incorporates LAT40's contributions to heat stress analysis and Urban Heat Island assessment capabilities, derived from satellite Earth Observation data. Second, the integration of URBREATH methodologies into LAT's flagship geospatial analytics platform enables cities to make evidence-based decisions for sustainable urban planning and environmental monitoring. Third, LAT will enhance its satellite data marketplace with URBREATH-validated datasets, including land surface temperature, vegetation health, urban heat islands, and climate risk indicators derived from pilots across Mediterranean, Atlantic and Continental climate zones.

Exploitation follows LAT's Software as a Service model targeting the European climate resilience market. Target customers include municipalities, environmental agencies, urban planning consultancies, insurance companies, real estate developers and agricultural businesses. Revenue streams comprise annual dataset licensing, API access fees for real-time monitoring, consulting services for implementing Nature-Based Solutions and white-label solutions that enable partners to integrate LAT's technology under their own branding. LAT's marketing strategy emphasises the combination of satellite-derived intelligence, AI-powered geospatial analysis, and URBREATH-validated methodologies through participation in smart cities conferences, direct outreach to pilot cities for continued collaboration and content marketing highlighting scientific rigour and practical applicability.

3.17 BLOX – FORENINGEN BLOXHUB

BLOXHUB (BLOX) will primarily leverage the project's results through knowledge sharing, internal integration, and collaboration across our ecosystem of members and partners. As a membership organisation, BLOX' primary focus is to ensure that the outcomes directly contribute to building collective knowledge and support the sustainable transition in urban areas. The results related to NBS, liveability, digital urban tools and co-creation methodologies will be integrated into BLOX ongoing work on urban innovation and sustainability. They will inform the design of future knowledge-sharing activities, such as roundtables and workshops, and will inform ongoing and future projects.

The exploitation process will be continuous throughout the project. BLOX will use interim results and early learnings to inform its ongoing knowledge-sharing activities, and test and present them in roundtables, workshops and events.

Internally, the results will strengthen BLOX' knowledge base and capacity to support and collaborate with members and partners in adopting innovative approaches to sustainable urban development. Externally, BLOX will leverage its various platforms to ensure that knowledge reaches its ecosystem.

The expected impact is increased capacity within the organisation and among its members and partners to work with digital tools and NBS in the context of the green transition. Over time, the results will help shape BLOX' future initiatives in sustainable urban transformation.

3.18 TEL – TELESTO TECHNOLOGIES PLIROFORIKIS KAI EPIKOINONION

TEL is a technological provider contributing to URBREATH by creating and developing the e-participation mobile application. The e-participation mobile app is developed for both Android and iOS, providing a user-friendly space where diverse stakeholders, such as decision makers, citizens, etc., can exchange ideas, collaborate and co-decide on aspects related to their city's plans and initiatives. This is done by integrating communication channels, interactive geolocation features, surveys and other functionalities. Under the URBREATH project, the mobile application is expected to progress from TRL 4 to 6, validating its functionality and usability. TEL's participation in URBREATH further increases its knowledge capital in smart solutions for diverse stakeholder engagement and enhanced communication, strengthening its technological expertise, improvement and innovation capacity.

Individual Exploitation Plan: TEL's solution primarily targets the public sector, focusing on cities, municipalities, policymakers and governance institutions. Elements of the developed solution may be leveraged for continuous improvement in future projects. At the same time, TEL plans to pursue strategic collaborations with cities, municipalities and institutions across Europe, including the e-participation mobile application in its product portfolio as a commercial, licensed product, to reinforce its position in digital participation and target the smart cities and digital governance markets.

Joint Exploitation Plan: TEL will explore potential common commercialisation strategies and potential joint exploitation agreements with other URBREATH partners, as the different URBREATH outcomes can complement one another, and market synergies can be identified.

3.19 EXUS – EXUS SOFTWARE MONOPROSOPI ETAIRIA PERIORISMENIS EVTHINIS

EXUS will exploit three key technological outcomes developed within URBREATH: the AI model for flood risk assessment and predictive monitoring, the Adaptive Rainfall-Infiltration Tracking tool, and the Visual Interpretable and Explainable AI (VIE-AI) component. The first two solutions advance from TRL 1 to 5, validating their predictive capabilities for hydrological events in relevant operational contexts, while VIE-AI progresses from TRL 5 to 7, enabling transparent and explainable insights into environmental AI decision-making.

Following the project, EXUS' sustainability strategy includes continuous updates, licensing, collaborations with other research projects and partners, and integration into future R&D initiatives, ensuring long-term relevance through ongoing improvements and partnerships. Sustainability will be further supported through public-private collaborations, participation in EU-funded projects, and the potential establishment of a dedicated business unit to maintain momentum in development and commercialisation.

EXUS' preferred exploitation routes include licensing to enterprises, API-based integration, joint ventures and white-label agreements, targeting municipalities, civil protection agencies and software vendors. To ensure sectoral adaptability, the flood and infiltration prediction tools will include enhanced data ingestion and customisation capabilities to meet the needs of local authorities in climate-sensitive regions. In parallel, VIE-AI will be expanded as a cross-sector explainability framework

applicable to diverse AI systems, emphasising integrability and user-friendliness to broaden adoption. Key risks, such as technological obsolescence, will be mitigated through routine updates, regulatory compliance, and active engagement with end-users. Through this strategy, EXUS aims to secure market penetration, foster innovation in environmental intelligence and contribute to building climate-resilient and transparent AI ecosystems across Europe.

3.20 OASC – OPEN & AGILE SMART CITIES

Individual Exploitation: The role of OASC is to ensure, throughout the entire lifecycle of the URBREATH project, that standardisation principles and the Minimum Interoperability Mechanisms (MIMs) are appropriately embedded in the project’s technical activities and pilot implementations. This guarantees that the developed solutions and outcomes are interoperable, scalable and transferable to other cities beyond the project consortium.

OASC will actively exploit and disseminate the project results through its MIMs Working Groups, feeding insights gained from URBREATH — particularly those related to NBS — into the ongoing evolution of relevant MIM specifications. In doing so, OASC will also contribute to EU-level and global standardisation and policy forums dealing with the planning and implementation of NBS and sustainable urban transformation.

Furthermore, the best practices, lessons learned and key results from URBREATH will be shared widely through OASC’s communication channels and international events, reaching its network of over 200 member cities and communities worldwide, and even beyond, to ensure maximum visibility and impact.

3.21 CA – CLIMATE ALLIANCE | KLIMA-BÜNDNIS | ALIANZA DEL CLIMA e.V.

Individual Exploitation Result: Community of practice (ER1). Climate Alliance will build on the established community practices developed through the URBREATH project. This innovative approach to working will be a key outcome, widely disseminated across our network of over 2,000 members. The insights and learnings gained can inspire and guide other municipalities in implementing co-created nature-based solutions.

In particular, the Living Lab methodology—one of the project’s core results—is easily adaptable to other European initiatives, such as NetZeroCities and related Horizon and LIFE funding lines.

The anticipated impact is the adoption of an innovative and participatory approach that enables more effective and efficient adaptation planning, fully embedded within existing community structures.

The implementation timeline foresees this way of working being adopted or continued immediately, or within one year after the completion of the URBREATH project. The primary resources required will be human — within Climate Alliance, participating municipalities and our European partners.

3.22 FIC – FUNDACION PARA LA INVESTIGACION DEL CLIMA (FICLIMA)

FIC plans to commercialise three core scientific outputs generated within the URBREATH project, which are local climate projections, AI-driven seasonal forecasting, and AI-based weather forecasting. The climate projection component has successfully advanced from TRL 7 to TRL 8 after completing all validation procedures. At the same time, the seasonal and weather forecasting services have progressed from TRL 5 to TRL 7, enabling the delivery of probabilistic predictions aligned with the highest model performance standards validated through verification protocols.

Beyond the project's conclusion, FIC's sustainability approach is based on continuous system enhancement, licensing models, strategic partnerships and integration into future research initiatives, guaranteeing long-term market and scientific relevance. This approach will be reinforced through public-private collaboration, ongoing participation in European R&D programmes, and the potential creation of a dedicated business service line to sustain both technological development and commercialisation. In the long term, graphical data visualisation will remain available through collaboration with technical partners such as ENG and VCS, or through FIC's proprietary web-based viewer.

The preferred commercialisation pathways include licensing agreements via WMS delivery, API-based integration for enterprise systems, strategic partnerships, and white-label solutions to support cities, emergency management bodies and environmental software providers. To ensure operational relevance in each new deployment, the localised climate projections and the seasonal and weather forecasts will be co-designed in cooperation with local technical stakeholders and authorities. In parallel, FIC will emphasise the strategic added value, operational applicability and clarity of representation of its outputs. Potential risks, including technological obsolescence, will be mitigated through systematic updating, compliance with emerging regulatory frameworks, and continuous user engagement. Through this strategy, FICLIMA aims to achieve broad market adoption, drive innovation in environmental sustainability, and contribute to the resilience of ecosystems and urban areas throughout Europe.

3.23 TRA – TRAZA TERRITORIO, S.L.L.

As a consultancy working at the intersection of social research, urban transformation and sustainability, Traza Consultoría will exploit the URBREATH results both individually and jointly to replicate good practices and lessons learned from the project:

Individual Exploitation: TRA will leverage the results by incorporating the methodologies and approaches developed throughout the URBREATH project's lifespan into its future work. The experience gained through participatory, research-based and co-creation methodologies will inform TRA's internal practices and strengthen its capacity to design socially inclusive and community-driven urban interventions that utilise NBS. Specifically, TRA will further exploit the Social Applied Research conducted in the Villaverde district, disseminating its findings through both the outreach booklet developed for local stakeholders and the extended report aimed at academic and professional audiences. The expected impact is scientific and professional, supporting research and promoting

knowledge transfer. Also, TRA will integrate the innovative, interdepartmental ways of working developed with the City of Madrid during URBREATH, applying these learnings to other ongoing projects in Villaverde and beyond, ensuring the long-term use and replication of the project's outcomes.

Joint Exploitation: Traza, together with the URBREATH partners, will contribute to the joint dissemination and exploitation of the project's outcomes at both local and regional levels. By participating in collaborative workshops, webinars and public events, TRA will support the replication and scaling up of the social, environmental and innovative impacts generated by the project's pilot actions in different cities. This joint effort will foster the creation of more sustainable and inclusive urban spaces that promote co-creation and community ownership through the implementation of NBS.

3.24 BAS – BASURAMA ASOCIACION

Individual Exploitation: Basurama will utilise the experience, methodologies and results gained in URBREATH to enhance its work in the creative transformation of public spaces and community engagement. The tools, strategies and case studies developed during the project—especially those related to nature-based solutions and participatory urban interventions—will be applied in future Basurama projects both in Europe and internationally. Outputs such as toolkits, visual materials, and co-creation approaches will be integrated into BAS' ongoing work with municipalities, cultural institutions and citizen initiatives.

Joint Exploitation: In collaboration with URBREATH partners, Basurama will contribute to the joint dissemination and broader adoption of project outcomes. This includes co-developing materials, participating in joint workshops, and supporting the replication of successful pilot actions in other European cities. By combining expertise, networks and communication channels, the consortium aims to maximise the impact of the methodologies and solutions developed, ensuring that knowledge and best practices are shared and adapted among all partners and stakeholder groups.

3.25 DML - DARK MATTER LABORATORIES BV

Individual Exploitation: Dark Matter Labs (DML), as a beneficiary of the URBREATH project, contributes to the consortium's exploitation activities by integrating key findings into its broader work with Madrid and other cities. DML will leverage the project's results by incorporating the developed tools and methodologies into its city-support services, particularly in areas such as urban resilience, climate adaptation and stakeholder engagement. This may involve presenting the results through workshops and publications. DML aims to continuously improve and expand its service offerings for municipalities, helping them tackle the most pressing challenges of our times. Through this process, DML aims to enhance internal processes and contribute to advancing urban resilience practices, with a focus on developing practical, scalable solutions for cities facing climate-related challenges.

Joint Exploitation: DML, together with UPM and other URBREATH partners will support Madrid, in its role as a Mission City within the EU Mission on Climate-Neutral and Smart Cities, to transfer the project's results and lessons learned to the broader network of European Mission Cities through the Spanish Cities Platform citiES2030 and the NetZeroCities (NZC) knowledge and replication repository.

3.26MAD - AYUNTAMIENTO DE MADRID

The Madrid City Council, through its General Directorate for Energy and Climate Change, will utilise the URBREATH results both individually and in collaboration with project partners to enhance municipal capacities for climate-neutral and resilient urban transformation.

Individual Exploitation: The City of Madrid will build upon the project’s methodologies, nature-based solutions and participatory frameworks to enhance its local strategies for decarbonisation, climate adaptation and social inclusion. The outcomes will directly inform municipal planning instruments such as the Climate Neutrality Roadmap (2030) and the Urban Regeneration Strategy, integrating systemic and data-driven approaches into local policies. Results will also be applied to ongoing urban experiments — including the transformation of schoolyards, public spaces and neighbourhood pilots — serving as demonstrators for institutional innovation and citizen engagement. Key milestones include the operational integration of URBREATH tools into the city’s planning processes (2025–2026) and their replication in new districts through the municipal Climate Office (2027).

Joint Exploitation: As a Mission City within the EU Mission on Climate-Neutral and Smart Cities, Madrid will collaborate with the Universidad Politécnica de Madrid (UPM) and other URBREATH partners to transfer the project’s results and lessons learned to the broader network of European Mission Cities. This will be achieved through two complementary pathways:

1) the Spanish Cities Platform citiES2030, which coordinates the national cluster of Mission Cities and facilitates multi-level collaboration among municipalities, academia, and national agencies; and 2) the NetZeroCities (NZC) knowledge and replication repository, which enables peer-to-peer learning and portfolio-based governance across the Mission network.

Through these mechanisms, Madrid will contribute to scaling URBREATH’s systemic, participatory, and nature-based approaches, fostering cross-city learning, replication, and institutional innovation towards climate neutrality. Key milestones include aligning URBREATH outcomes with NZC replication activities (2026) and disseminating and adopting them across the Mission Cities network (2027).

3.27 LEU – STAD LEUVEN

Leuven’s exploitation of URBREATH focuses primarily on the practical testing and use of project tools in living labs, as well as on communication and dissemination activities through a variety of platforms. Leuven actively applies the URBREATH tools to its pilot case and deploys them in several living lab settings (internal municipal departments, citizen groups, university stakeholders, etc.). Through this process, the city is exploring how different departments can benefit from a digital twin for urban planning and climate adaptation, both for analytical purposes (enhancing evidence-based and objective decision-making) and for visualisation and communication with citizens. The digital twin has been identified as a «breakthrough project» in the city’s climate contract, i.e., a project with the potential to significantly accelerate progress towards climate neutrality. In this sense, URBREATH provides a key pathway for creating a digital twin for Leuven and contributes directly to the implementation of the city’s climate-neutrality mission and its breakthrough project portfolio.

Some analytical tools, such as the Biotope Area Factor (BAF), are not yet embedded in standard municipal procedures. They will, however, be piloted and evaluated over the course of the project and may inform future policymaking. Leuven is also actively exploring opportunities to apply the tools beyond the initial pilot site, in additional cases and neighbourhoods. In parallel, the project serves as a platform to raise awareness among citizens through workshops. Co-creation workshops are used to ensure that the redesigned spaces respond to the local community's needs and expectations.

Exploitation and dissemination will take place both individually and in collaboration with other partners (from URBREATH and from the City of Leuven). Key platforms include, among others, the EU Mission Cities framework (e.g., the Mission Cities platform), UrbanLab/Leuven 2030, as well as Flemish, national, and international conferences. Leuven also actively participates in (often research-based) interviews and contributes to one-to-one exchanges and academic publications to share lessons learned and emerging practices.

The emphasis is on knowledge sharing, mutual learning, inspiration and scaling up of successful practices. In this way, URBREATH is expected to serve as a valuable building block for future projects and funding opportunities supporting Leuven's climate-neutral and resilient urban development.

3.28 TLN – TALLINNA LINN

1. Description of the Process for Developing Nature-Based Solutions

The developed process description for nature-based solutions will be used internally to improve the organisation's capacity to plan, design and implement sustainable and environmentally responsible projects. It will serve as a methodological guideline for future project development and decision-making, ensuring that nature-based approaches are systematically considered and integrated into our operational and planning processes.

The developed process description for NBS will be used internally to improve the organisation's capacity to plan, design and implement sustainable and environmentally responsible projects.

Expected Impact:

- **Organisational improvement:** Establish a standardised internal process for developing nature-based solutions.
- **Capacity Building:** Enhancing staff competence in sustainability and nature-based design.
- **Strategic alignment:** Strengthen the organisation's position in environmentally focused projects and increase competitiveness in future funding opportunities.
- **Environmental and societal benefits:** Promote the use of sustainable and resilient approaches in Tallinn's internal and external activities.

2. Environmental Education Trail on the Pilot Site

A permanent outdoor learning environment demonstrating NBS and climate change mitigation actions. The trail features information and interactive exhibits tailored for different age groups—children, students, and adults—to enhance awareness and understanding of environmental sustainability, biodiversity and climate adaptation.

Exploitation Strategy – Academic Use:

The Environmental Education Trail will be exploited for academic and educational purposes. It will serve as an open-air classroom and demonstration area supporting environmental education, awareness-raising and experiential learning. The trail will be used by schools, universities and community groups for guided visits, thematic workshops and independent exploration.

The site will also serve as a living laboratory for research and educational cooperation, enabling students and educators to observe and analyse practical examples of nature-based solutions.

By integrating educational materials for all age groups, the trail will promote environmental literacy, inspire behavioural change and strengthen public understanding of climate change and mitigation.

The trail will also be used internally by the organisation for staff training, outreach events and to showcase project results to partners, stakeholders and decision-makers.

Expected Impact:

- **Educational impact:** Increased awareness and understanding of climate change, mitigation and nature-based solutions among children, students and adults.
- **Scientific and academic impact:** Supports research, educational projects and collaboration with universities and schools.
- **Societal impact:** Encourages environmentally responsible attitudes and sustainable behaviour within the local community.
- **Organisational impact:** Enhances the organisation's role as a leader in environmental education and sustainability communication.

3.29 CLUJ – MUNICIPIUL CLUJ-NAPOCA

Cluj-Napoca will use the URBREATH results to apply nature-based and climate-resilient solutions in the Iris and Someşeni neighbourhoods. The focus is on citizen participation, co-design and improving the quality of life through greener and more inclusive public spaces.

The city will build on the project's outcomes through these main directions:

1. Integrating digital participation tools into the city's digital governance system to make decision-making more transparent and participatory.
2. Using analytical and environmental tools developed in URBREATH to support data-based planning and future green interventions.
3. Running the Local Living Lab together with citizens, students from USAMV and local partners to co-design and test small-scale urban solutions.
4. Organising temporary community activities in the pilot areas, such as gardening workshops, seed bomb making or local street markets, to activate public spaces and connect residents.
5. Applying adaptive planning and innovative procurement methods to allow flexibility and replication of nature-based projects in other parts of the city.
6. Sharing good practices and project results through the URBREATH digital tools (3D Digital Twin, E-Participation Platform and NBS Registries) to support future urban initiatives.

These actions will help Cluj-Napoca integrate URBREATH methods into local planning and continue its work toward a greener, more resilient and citizen-driven city.

3.30PA – COMUNE DI PARMA

The results achieved in Parma's pilot district through the testing of NBS, digital tools and participatory processes will be used to strengthen the municipality's capacity to design and manage sustainable urban regeneration and climate adaptation interventions.

The methodology developed in URBREATH will serve as the basis for a climate adaptation plan that embeds the principles and best practices emerging from the pilot, making them replicable in other neighbourhoods of the city. This will support the diffusion of a shared, city-wide approach to climate adaptation and accelerate the development of coherent interventions in the most vulnerable areas.

To enable this replication, the municipality will establish a permanent, intersectoral working group on adaptation, building on the data, tools and practices developed in the project. This group will foster stable collaboration among municipal departments, helping to overcome administrative fragmentation and enabling more coherent interventions from technical, social and energy perspectives.

In parallel, the digital technologies piloted in URBREATH will be integrated into the city's digital twin, thereby expanding Parma's technical infrastructure and enhancing the predictive and management capabilities of the relevant departments.

Finally, the URBREATH outcomes will feed into the revision and strengthening of local strategies for decarbonisation, climate adaptation and social inclusion, contributing directly to the acceleration of Parma's roadmap towards climate neutrality by 2030.

3.31 AT – ANAPLASSIS ATHINA ANONYMI ETAIREIA

The City of Athens aims to capitalise on the URBREATH outcomes to advance climate-resilient solutions and participate in urban regeneration.

The pilot site, located on Vasilisis Olgas Avenue, will serve as a demonstrator of how digital participation tools, co-creation processes and data-driven heat mitigation strategies can transform a high-impact urban corridor into a sustainable and citizen-friendly public space.

To this end, Athens will exploit the URBREATH results through the following four pathways:

1. Adopt the validated URBREATH digital tools and datasets, focusing on the e-participation tools, within the city's digital governance ecosystem to enable transparent and inclusive decision-making, and a bottom-up approach to citizens involvement in future projects.
2. Leverage URBREATH analytical and environmental tools to guide and conceptualise evidence-based design in the following projects.
3. Operate the Local Living Labs as open innovative environments for testing co-creation and environmental solutions, mainly focusing on
 - a. facilitating the co-creation sessions with citizens, SMEs, academia and municipal experts,
 - b. testing and evaluating the URBREATH digital tools and design concepts in real conditions, and
 - c. documenting and sharing the lessons learnt to inform future city projects.
4. Integrate URBREATH innovative and validated methods and results into municipal planning, ensuring replication across other districts of Athens.

5. Adopt the URBREATH innovative procurement approaches and Adaptive Pathways to explore flexible, long-term strategies by mapping potential responses to evolving climate and social risks, identifying critical decision points, and enabling proactive planning rather than reactive crisis management. This will ensure that interventions along the Vasilis Olgas Avenue and in other urban areas can adapt over time to changing conditions, supporting resilient and future-proof urban planning.
6. Identify, map and actively involve stakeholders through participatory workshops aiming at raising awareness and foster engagement. Citizens and communities, research institutions and universities, local businesses and sports clubs, cultural and heritage actors, property owners along the pilot site, and governmental actors will lead the shift from the top-down governance to participatory, stakeholder-oriented decision-making.

3.32 AA – AARHUS KOMMUNE

The key exploitable results for the City of Aarhus include:

- ER3 (Innovative simulation models for urban regeneration and climate neutrality): Aarhus Municipality is working toward greater climate resilience to achieve CO₂ neutrality by 2030. This involves sustainable initiatives, including various levels of NBS, with a particular focus on trees as a central element. The 3-30-300 rule is applied as a key tool in this effort.
- ER4 (Advanced digital twins with in-depth participatory urban planning functionalities for restructuring urban neighbourhoods) / ER10 (Dynamic Layer Plugin) / ER11 (NBS extensions for VC Planner) / ER12 (WMS-Time): Aarhus Municipality is transitioning from a 3D city model to a more advanced digital twin. The Virtual City System (VCS) is seen as a central platform for visualizing data and making it accessible to project teams within the municipality, as well as to citizens and politicians. The focus is on integrating advanced data-driven functions to support participatory planning, internal urban planning, and communication of processes and results.
- ER14 (Dashboard Visualisation): Combining and collecting data, goals and results.
- ER18 (AI model for flood risk assessment and predictive monitoring) / ER20 (Adaptive Rainfall-infiltration Tracking) / ER21 (Shaded Area calculation) / ER22 (Snow pile analysis) / ER23 (Waterflow analysis): By combining data, goals, and outcomes, Aarhus aims to address 100-year events and enhance the city's resilience against such occurrences. Through simulations and predictions, project teams will be able to make qualitative, data-driven decisions.

3.33 PI – SPRAVA INFORMACNICH TECHNOLOGII MESTA PLZNE, PRISPEVKOVA ORGANIZACE

Individual exploitation: SITMP/Pilsen aims to integrate the results of the URBREATH project into its city management and mobility systems, thereby strengthening data-driven decision-making and supporting sustainable urban development. By applying the developed tools and methodologies, the city aims to enhance mobility, improve environmental quality and improve the overall quality of life for its

residents. Additional tools and datasets will be published as open data, providing deeper insights into city operations and supporting innovation within the city's data ecosystem. These efforts will further enhance urban resilience and the efficiency of public service delivery.

3.34 KA – KAJAANIN KAUPUNKI

The key exploitable results for the City of Kajaani include:

- ER4 – Advanced Digital Twins with Participatory Urban Planning Functionalities: Kajaani aims to utilise digital twin technologies to support participatory planning. Combined with snow pile and waterflow analyses (ER22 & ER23), this tool can assist especially in identifying optimal locations for snow disposal sites.
- ER22 – Snow pile Analysis & ER23 – Waterflow Analysis: These analytical tools can be used to support data-driven decision-making in urban infrastructure planning, particularly in evaluating and selecting new snow disposal areas. The integration with digital twins (ER4) enables scenario modelling and stakeholder engagement.
- ER14 – Dashboard Visualisation: Kajaani will explore the use of dashboard visualisation tools for both internal and external communication. These dashboards can help present complex environmental and planning data in a clear and accessible format for city officials, residents and other stakeholders.
- ER13 – NBS Registry: The registry can serve as a knowledge base for nature-based solutions, supporting the planning and selection of new NBS sites in Kajaani.

The City of Kajaani plans to integrate these tools into its strategic urban planning processes. The tools are expected to support cross-departmental collaboration, stakeholder engagement and evidence-based decision-making.

3.35 USTUTT – UNIVERSITY OF STUTTGART

The NBS Evidence-Based Impact Assessment and Evaluation Framework is a methodological basis for assessing the effectiveness of NBS in ecological, economic and social terms. It enables cities to conduct evidence-based and comparable assessments of their NBS measures, supporting strategic decisions in the field of climate adaptation.

The framework is intended for use in future projects with local authorities and, subsequently, with companies, and will be integrated into the Morgenstadt Index as a new pillar. The Morgenstadt Index is an evaluation and control instrument developed by Fraunhofer IAO to analyse the sustainability and innovation performance of cities. The integration of the NBS framework adds a key dimension of climate-resilient urban development to the index. This creates a scalable tool for the long-term evaluation and management of urban sustainability strategies. It strengthens the research and consulting activities of Fraunhofer IAO and USTUTT, offering added value for policy, planning and research through standardised, data-based analyses.

3.36 MUN – MUNICIPIA S.P.A.

Municipia S.p.A. has developed the Dashboard Suite for Environmental Monitoring, based on Apache Superset, to support local administrations in managing NBS.

The suite enables the visualisation of multi-source environmental data—such as air quality, soil moisture, temperature, vegetation and water indicators—through customisable dashboards.

Its scalable and interoperable data model ensures integration with existing municipal systems (GIS, IoT networks, open data portals).

The dashboards offer analytical tools for data-driven decision-making, enabling municipalities to plan and evaluate the effectiveness of NBS interventions.

As a leading provider of digital solutions for public administrations, Municipia will integrate this product into its Smart City and Environmental Management platforms.

The tool addresses the growing market demand for monitoring and evaluation solutions that align with the European Green Deal and the Climate-Neutral Cities Mission.

Target customers include municipalities, regional authorities, environmental agencies and utility companies.

Commercialisation will involve product refinement, integration with existing Municipia systems (Urban Control Room, Smart Environment Suite) and promotion through Public Administration networks, webinars and trade fairs.

Municipia's sales teams will leverage Municipia's framework agreements and public procurement channels, ensuring rapid market uptake and scalable adoption across Italian and European cities. Within Municipia, the Dashboard Suite will act as a foundation for future developments in IoT data integration, visualisation and environmental analytics, strengthening the company's expertise in open-source Business Intelligence tools such as Apache Superset. It will also foster co-creation with municipalities, enabling the development of new value-added services based on real-time environmental insights. The expected impact is threefold: economic, through enhanced competitiveness and new business opportunities; societal, by empowering local authorities to monitor and communicate the benefits of NBS; and technological, by advancing open, modular and interoperable solutions for urban data management. The exploitation relies on skilled data analysts, developers and sustainability experts, supported by Municipia's cloud infrastructure, interoperability frameworks and open-source technologies. Funded through internal R&D and reinvested project resources, this initiative leverages Municipia's solid market presence and partnerships with public administrations to ensure a high level of readiness and long-term sustainability.

3.37 SPG – SOUTH POLE

ER9: The exploitation strategy involves creating innovative business models (financing models) designed to support the commercialisation and sustainability of urban development technologies, especially those related to urban nature-based solutions. The results would also be used internally, for other projects, such as the NetZeroCities project. The anticipated impact includes the innovative business models (financing models) being adopted by municipalities or companies, which ultimately

lead to increased financing of urban NBS. This will help to attract funding and drive the market uptake of sustainable urban development technologies.

The timeline is that these models will be implemented immediately or within one year after the completion of the URBREATH project. The resources needed are mainly human, including those from South Pole, municipalities, investors and companies that develop their business models.

4 Business Plan and Sustainability Model (stable version)

4.1 Introduction

The section presents the stable version of the URBREATH Business Plan and Sustainability Model, which builds upon the preliminary versions developed in earlier stages of the project. It reflects the outcomes of the exploitation planning process, the evolution of the Key Exploitable Results (KERs), and the feedback gathered from pilot activities, stakeholder engagement and exploitation workshops conducted under Task 8.4.

The purpose of this section is twofold: first, to provide a structured business framework for the future uptake and scaling of URBREATH results; second, to articulate a sustainability model that ensures the long-term viability and impact of the project beyond its funded duration. In line with the three-pillar exploitation strategy outlined in the Grant Agreement, the business plan consolidates findings from stakeholder analysis, market research and partner inputs into a coherent roadmap toward commercialisation and institutional embedding.

The business plan does not aim to define a single commercial product, but rather a portfolio of services, tools, methodologies and policy-enabling outputs that together form the basis for systemic urban regeneration. It acknowledges the diversity of partners' exploitation interests—ranging from public administrations and research organisations to SMEs and civic actors, and therefore includes both individual and joint pathways for exploitation.

In this stable version, special attention is given to aligning the KERs with specific stakeholder value propositions, mapping viable business models and identifying realistic go-to-market strategies. Moreover, it introduces an operational sustainability model that outlines how key assets (such as the digital tools, methodological frameworks and co-creation infrastructures) can be maintained, evolved and expanded after the end of the project.

The following subsections elaborate the URBREATH business vision, market positioning, key exploitable assets, stakeholder value models and scaling mechanisms. The section concludes with a synthesis of strategic directions and the next steps for finalising the exploitation and business planning process by Month 48 (D8.7).

4.2 Business Vision and Market Positioning

URBREATH's business vision is to catalyse a new generation of urban transformation services that fuse nature-based, data-driven and community-led approaches into a unified framework for climate resilience. At the core of this vision is the recognition that cities require not only technological innovation but also institutional and participatory reform to confront the systemic challenges of climate change, social fragmentation and urban degradation.

Rather than offering a single commercial solution, URBREATH positions itself as an integrated service architecture, a modular ecosystem of interoperable tools, data assets, governance methodologies and engagement mechanisms. This architecture supports cities in planning, implementing and scaling NBS, while leveraging advanced digital enablers such as LDTs. AI-based impact models, and multi-

dimensional participatory frameworks. It aligns with the emerging global trend toward “Resilience-as-a-Service (RaaS)” where technological, ecological and social capabilities converge in a service-oriented model tailored to the needs of urban and regional actors.

URBREATH’s unique positioning stems from three interlocking differentiators:

1. **Hybridisation of Technical and Nature-Based Solutions:** The project does not treat NBS as isolated green interventions but embeds them in a broader technical and governance ecosystem, combining AI, LDTs, environmental modelling and co-creation methodologies.
2. **Stakeholder-Centred Innovation:** Unlike many top-down smart city or green infrastructure initiatives, URBREATH puts **community engagement and social innovation** at the heart of the design, deployment and evaluation process. This participatory approach is structured through Local Living Labs, replication roadmaps and context-sensitive co-design methodologies.
3. **Climate-Zone and Scale Replicability:** Through its implementation in frontrunner cities across diverse climatic zones—Continental (Cluj-Napoca), Atlantic (Leuven), Mediterranean (Madrid), Boreal (Tallinn)—URBREATH has developed a set of transferable, adaptable, and evidence-based assets that can be applied across European and global contexts. This is further reinforced by the active engagement of Follower Cities (Athens (Greece), Aarhus (Denmark), Kajaani (Finland), Parma (Italy) and Pilsen (Czech Republic), which serve as pathways for uptake and market expansion.

In market terms, URBREATH does not compete in any single vertical. Instead, it operates at the intersection of multiple fast-growing domains:

- The climate adaptation market (including NBS and impact assessment tools),
- The urban digital twin and simulation sector,
- The AI for urban planning and environmental management segment, and
- The broader domain of Smart and Sustainable Cities, particularly within the EU’s Green Deal and Mission “100 Climate-Neutral Cities” policy frameworks.

The project thus anticipates the formation of a new integrated urban resilience market space, where impact will be defined not by individual tool performance but by the ability to orchestrate digital, natural and social assets into deployable services for climate-neutral and inclusive urban futures.

4.3 Key Exploitable Results (KERs) and Business Potentials

URBREATH has identified a structured portfolio of KERs that represent the foundation of its exploitation strategy. These results encompass technical tools, service models, co-creation methodologies and policy-enabling frameworks—each targeting different stakeholder groups and application scenarios. The KERs have been classified across various categories—technological, methodological, digital, governance-related and educational—reflecting the project’s cross-disciplinary approach to systemic urban transformation.

The business potential of each KER has been assessed according to three main criteria:

- **Replicability:** Can the result be transferred or adapted across different urban, climatic or institutional contexts?
- **Scalability:** Can the result be expanded in terms of users, applications or geographies?

- **Commercial viability:** Can the result generate revenue, reduce costs or lead to cost-effective public service delivery?

The KERs are the product of iterative co-design between technical partners, cities and end-users. Below are selected examples representing the broader exploitation landscape:

1. URBREATH Local Digital Twin Toolbox

Category: Technological / Digital Tool

Potential: High demand for modular, geospatially enabled tools that integrate NBS planning, simulation and citizen engagement in both commercial and public sectors. May be exploited as a standalone SaaS platform or embedded in municipal IT systems via open APIs.

Target users: Municipalities, urban planners, engineering consultancies, city digitalisation agencies.

2. AI Models for Environmental and Socioeconomic Impact Assessment

Category: Technological / Modelling Framework

Potential: Key enabler for evidence-based planning and NBS justification. Strong alignment with demand for predictive tools in the climate-tech and urban analytics sectors.

Exploitation pathway: Integration into smart city platforms; licensing to public authorities or infrastructure providers.

3. URBREATH Participatory Co-Creation Methodology

Category: Methodological / Social Innovation

Potential: High relevance for cities aiming to fulfil requirements for inclusive, participatory policy development. Applicable to NBS, climate planning and regeneration initiatives.

Business model: Consultancy-led implementation; certification schemes for facilitators; embedding in urban planning protocols.

4. KPI Catalogue and Impact Monitoring Framework

Category: Governance / Decision Support

Potential: Offers cities a harmonised, multi-scalar impact evaluation framework for NBS. Aligns with Horizon Europe KPIs and EU Green Deal metrics.

Exploitation model: Integration with LDTs; licensing as part of the URBREATH integrated solution; contribution to standardisation efforts.

5. Follower Cities Replication Roadmap Toolkit

Category: Policy / Strategic Planning

Potential: Serves as a structured pathway for new cities to adopt URBREATH's outcomes. High potential in supporting regional authorities, clusters and EU-level missions (e.g. NetZeroCities).

Business potential: Consultancy services; integration in EU-funded capacity building and replication calls.

6. Nature-Based Solutions Deployment Protocols

Category: Technical / Operational

Potential: Tangible outputs (site designs, implementation plans, procurement templates, urban greening investment plans) with reuse potential.

Target market: City authorities, green infrastructure developers, public procurement agencies.

The KER portfolio reflects a deliberate diversification strategy, combining results that are

- publicly reusable (open methodologies and capacity building materials),
- commercially scalable (e.g., AI modules, LDT-based tools), and
- institutionally embedded (e.g., co-creation methods, monitoring frameworks).

In the upcoming sections, these KERs will be further connected to stakeholder value propositions (Section 4.4), specific business models (Section 4.5) and sustainability strategies (Section 4.7).

4.4 Value Proposition and Stakeholders

URBREATH's exploitation strategy is fundamentally anchored in the principle of multi-stakeholder value creation. Each of the KERs developed in the project is designed to deliver specific, tangible value to one or more categories of stakeholders across the urban innovation ecosystem. This value may be technical, operational, strategic, financial, environmental or social. The identification and mapping of these value propositions have been informed by both bottom-up (Living Lab feedback, stakeholder engagement) and top-down (policy, market and funding alignment) processes.

The following stakeholder categories are central to the URBREATH value model:

1. Local Authorities and City Administrations

Value Proposition: URBREATH equips cities with an integrated suite of tools to plan, simulate, implement and monitor nature-based and hybrid solutions for climate resilience. The platform supports evidence-based decision-making, citizen co-creation and transparent governance through digital twins, AI-based models and KPI dashboards.

Strategic Benefits:

- Enhanced urban climate adaptation and mitigation capacity
- Compliance with EU Green Deal and Mission "100 Climate-Neutral Cities" commitments
- Improved stakeholder engagement and trust
- Access to open-source, customisable tools and replication roadmaps

2. Regional and National Public Authorities

Value Proposition: URBREATH offers scalable governance and planning frameworks that can be adopted across multiple urban areas or integrated into national green transition strategies. The methodologies can support national NBS deployment plans, digital transition initiatives and smart specialisation strategies.

Strategic Benefits:

- Evidence-based policymaking tools and standardised KPIs
- Alignment with SDGs, EU Taxonomy and climate reporting obligations
- Scalable replication potential through regional clusters and procurement platforms

3. Technology Developers and Service Providers (SMEs, Startups, IT Integrators)

Value Proposition: URBREATH generates a portfolio of interoperable software assets (e.g., digital twin viewers, AI models, participatory interfaces) that can be commercialised, licensed or integrated into broader service offerings. These assets lower the entry barriers for SMEs to participate in green urban transformation markets.

Strategic Benefits:

- Access to validated, domain-specific tools with market potential
- Business opportunities through integration, customisation and service provision
- Visibility and credibility through participation in a high-impact Horizon project

4. Research and Innovation Actors (Universities, RTOs, Knowledge Hubs)

Value Proposition: The project offers a unique experimental and empirical base to test, validate and refine advanced tools and methodologies for urban resilience, nature-based interventions and participatory governance.

Strategic Benefits:

- Access to multi-scalar datasets and real-life implementation cases
- Opportunities for academic publishing, patents and standardisation involvement
- Basis for new research proposals and Horizon Europe clustering

5. Civic Actors, NGOs and Citizen Groups

Value Proposition: URBREATH empowers communities to co-design the green future of their cities. Through participatory tools, open data access and visualisation technologies, citizens are actively involved in scenario planning, feedback loops and impact monitoring.

Strategic Benefits:

- Increased democratic legitimacy and local ownership of urban interventions
- Accessible visual and digital tools for community engagement and advocacy
- Empowerment of marginalised or underrepresented groups through targeted engagement

6. International and European Policy Actors (e.g., Mission Platforms, EC Directorates, EIB)

Value Proposition: URBREATH provides a model for operationalising mission-oriented innovation, citizen engagement and climate neutrality through systemic, cross-sectoral interventions. It serves as a demonstrator for integrated policy approaches.

Strategic Benefits:

- Contribution to EU Missions, New European Bauhaus, and Just Transition strategies
- Reusable governance and replication models for broader EU policy support
- Showcases innovative public-private-civic partnerships at urban level

Through this structured stakeholder-value mapping, URBREATH ensures that the exploitation process goes beyond conventional commercialisation. It instead builds an inclusive ecosystem of uptake, where both public and private actors can derive benefit—directly or indirectly—from the project results. The next section (4.5) translates these value propositions into concrete business models for selected KERs.

4.5 Preliminary Business Models per KER Category

This section presents the stable version of preliminary business models for selected KERs generated through URBREATH. Each business model reflects both the nature of the KER (e.g. digital tool, methodology, service) and the profile of the target stakeholders. The analysis follows a lean adaptation of the Business Model Canvas (BMC) structure, focusing on real-life feasibility and sustainability rather than speculative scaling.

Business model development in URBREATH is tailored to reflect the diverse nature of the consortium and the mixed exploitation intentions of public bodies, research entities, SMEs and civic actors. Thus, the business models include commercial, public sector-driven and hybrid governance models.

KER1: URBREATH Digital Twin Toolbox

- Type: Digital Tool / SaaS
- Customer Segments: City administrations, digital innovation hubs, smart city integrators
- Value Proposition: Customisable 3D visualisation and planning environment integrating climate scenarios, NBS simulations and participatory interfaces
- Revenue Streams: Subscription-based SaaS model; consultancy for deployment and customisation; integration services
- Channels: Direct Business-to-Government (B2G) sales; public procurement portals; city alliances (e.g., OASC, Living-in.EU)
- Key Activities: Maintenance of codebase, user training, deployment support, API integration
- Key Resources: Core development teams (e.g., VCS), server infrastructure, user interface assets
- Key Partners: Cities, urban tech SMEs, open-source foundations
- Cost Structure: Moderate – mostly staff costs, infrastructure hosting and customer support

KER2: AI Models for Environmental and Social Impact

- Type: Algorithmic Models / Analytics Toolkit
- Customer Segments: Public authorities, planning agencies, sustainability consultants, NGOs
- Value Proposition: High-resolution prediction and evaluation of NBS impact on climate, well-being and equity
- Revenue Streams: Licensing of models; “modelling as a service” contracts; integration in wider platforms
- Channels: Strategic partnerships with smart city integrators, research-to-market collaborations
- Key Activities: Continuous training and validation of models; context-specific calibration
- Key Resources: Annotated datasets, model source code, expert teams
- Key Partners: Climate modelling providers, cities, data platforms
- Cost Structure: Data management, computing resources, specialist personnel

KER3: Participatory Co-Creation Methodology

- Type: Methodological Framework / Service Model
- Customer Segments: Municipalities, NGOs, civic tech initiatives, international donors
- Value Proposition: Structured, evidence-based methodology for inclusive design of urban greening and resilience strategies
- Revenue Streams: Consulting services; training and certification of facilitators; integration in urban planning toolkits
- Channels: Horizon Europe clustering; capacity-building platforms; city networks
- Key Activities: Development of participatory process flows, design of workshops, production of engagement materials
- Key Resources: Trained facilitators, visualisation templates, online tools
- Key Partners: Social innovation labs, public engagement agencies
- Cost Structure: Human-intensive (moderate cost); potential for open-access delivery in public sector

KER4: NBS KPI Catalogue and Monitoring Dashboards

- Type: Digital Governance Tool / Decision Support System
- Customer Segments: Policy makers, city monitoring units, sustainability officers
- Value Proposition: Dynamic tool to track performance of NBS interventions using harmonised indicators
- Revenue Streams: One-off licensing fees; long-term service contracts; EU project reuse
- Channels: Integration in local digital twin ecosystems; technical platforms for Missions and Green Deal calls
- Key Activities: Indicator definition, dashboard maintenance, integration with external data systems
- Key Resources: Data visualisation teams, KPI libraries, user documentation
- Key Partners: Standards organisations, data platforms (e.g., DestinE, Copernicus), Eurostat
- Cost Structure: Mixed – development costs, long-term maintenance, training

KER5: Follower Cities Replication Toolkit

- Type: Strategic Planning Toolkit / Capacity Building Package
- Customer Segments: Regional authorities, networks of cities, EU-funded technical assistance schemes
- Value Proposition: Transferable toolkit and roadmaps for replicating NBS-based systemic transformation
- Revenue Streams: Public contracts under replication and scaling-up calls; integration in donor-funded missions
- Channels: Mission platforms, NetZeroCities, Covenant of Mayors, European Urban Initiative
- Key Activities: Toolkit refinement, adaptation to local contexts, advisory missions
- Key Resources: City templates, legal/procurement guidelines, case study database

- Key Partners: FLCs, European Commission - Directorate-General for Regional and Urban Policy (DG REGIO), development agencies
- Cost Structure: Low-medium, mainly staff time for customisation and support

Each business model is at a different stage of maturity. While digital tools like the Digital Twin Toolbox and KPI Dashboards are moving toward higher TRLs and early commercial deployment, others, such as the co-creation methodology or the replication toolkit, are more policy-driven and aimed at institutional uptake and systemic change.

In the next section (4.6), these models are connected to relevant markets and viable go-to-market strategies for each result type are explored.

4.6 Market Analysis and Go-to-Market Strategy

URBREATH enters a market landscape characterised by rapid transformation, policy-driven innovation and technological convergence. The pressure of climate change, coupled with the urbanisation of risk and infrastructure vulnerability, has given rise to a new composite market domain—where environmental, digital and participatory innovation are no longer siloed but integrated into what is increasingly being referred to as the “urban resilience” economy.

4.6.1 Market Dynamics

Across Europe and globally, three major high-growth domains are converging:

- **Climate Tech and Adaptation Solutions:** Projected Compound Annual Growth Rate (CAGR) of ~20% (Grand View Research, 2025), with public funding mechanisms such as the EU Mission “100 Climate-Neutral Cities”, the Green Deal and national recovery funds (e.g. RRF) fuelling demand for urban resilience services.
- **Urban Digital Twin (UDT) Platforms:** Valued at \$3.8 billion globally (MarketsandMarkets, 2025), this market includes municipal digitalisation tools, 3D modelling and simulation environments for infrastructure and planning.
- **AI in Urban Planning and Environmental Impact Assessment:** AI is increasingly being embedded into tools for dynamic scenario modelling, impact prediction, and real-time monitoring, with forecasted CAGR > 20% (Knowledge Sourcing Intelligence, 2025).

URBREATH is strategically positioned at the **intersection of these markets**, offering integrated, system-level solutions that leverage data, nature and co-creation for high-impact urban transformation.

4.6.2 Segment-Specific Trends and Entry Points

- **Municipal and Regional Governments:** Increasingly pressured to deliver climate-neutrality targets, they are seeking deployable tools—not just high-level strategies. Public procurement is shifting toward outcome-based, multi-actor solutions—creating space for consortia-based offers like URBREATH’s toolbox and services.

- **Smart City Integrators and Urban Tech SMEs:** These actors are looking for plug-and-play modules to integrate into larger platforms. URBREATH offers validated and interoperable software assets (e.g., DT modules, AI models) that can enhance existing urban tech offerings.
- **Consulting and Engineering Firms:** In need of validated impact frameworks and KPIs for planning tenders and projects involving NBS. The project’s dashboards and monitoring tools can be packaged for reuse or included in bid documentation.
- **Policy and Development Institutions:** The URBREATH replication toolkit and co-creation methods align closely with donor-driven and EU-funded capacity-building and replication calls, offering a direct route to scalability across regions.

4.6.3 Go-to-Market Strategy by KER Category

Table 1 - Go-to-Market Strategy by KER Category

KER Category	Go-to-Market Pathway
Digital Tools (e.g. LDT Toolbox, Dashboards)	Pilots-to-product pathway via frontrunner cities; SaaS or modular licensing to city IT units
AI Models and Simulation Engines	Integration in urban modelling platforms; bilateral licensing to urban analytics firms
Co-creation Methodology and Social Innovation Tools	Open-access framework with optional training and certification schemes (B2G2C model)
Monitoring and Evaluation Frameworks	Designed for inclusion in donor-funded projects and standardisation initiatives
Replication Roadmaps and Policy Toolkits	Direct delivery through technical assistance facilities; partnerships with city networks

The go-to-market approach in URBREATH balances

- direct exploitation by owners (via commercial licensing, consultancy, service delivery),
- institutional embedding (via public authority adoption or inclusion in policy frameworks), and
- collaborative scaling (via Horizon clustering, Mission platforms and replication alliances).

4.6.4 Early Engagement and Lead Channels

URBREATH has already created fertile ground for market access through

- four Frontrunner Cities acting as real-world demonstrators,
- five Follower Cities as replication testbeds and demand amplifiers,
- ongoing clustering activities with NetZeroCities, OASC, and the Climate-Neutral and Smart Cities Mission, and
- participation in sectoral events (e.g., Smart City Expo, European Climate Change Adaptation Conference, Associazione Nazionale Comuni Italiani - ANCI, Eurocities) and policy platforms.

These channels form the first layer of market outreach, supporting both commercial and public-interest exploitation.

4.7 Sustainability Model and Long-Term Vision

The long-term success of URBREATH depends not only on the uptake of its KERs but also on establishing robust mechanisms to ensure their maintenance, relevance and operational integration after the project's completion. This section presents the stable version of the **URBREATH sustainability model**, which integrates organisational, technical, financial and governance dimensions to safeguard the project's legacy and maximise impact across European cities and regions.

4.7.1 Sustainability Dimensions

URBREATH's sustainability is articulated around four mutually reinforcing pillars:

1. **Technical Sustainability:** Ensuring that core digital assets (e.g. digital twins, AI models, dashboards) remain functional, accessible and interoperable beyond the project lifespan. This includes open-source release strategies for selected components, versioning protocols and API documentation for future integration by third parties.
2. **Institutional Sustainability:** Embedding URBREATH methods and tools into municipal/regional workflows, public procurement templates and long-term planning frameworks. This also entails assigning stewardship roles to specific partners (e.g. city digital units, research institutions) for maintaining key outputs and processes.
3. **Financial Sustainability:** Identifying funding streams (public and private) to support further deployment, updates, training and scale-up. This includes opportunities through EU programmes (e.g. European Urban Initiative, LIFE, Interreg), national recovery funds and co-investment with private stakeholders in Public-Private-People Partnerships (PPPPs).
4. **Governance and Partnership Models:** Developing long-term collaborations for replication and policy influence. The URBREATH ecosystem (FRCs, FLCs, Mission platforms, NGOs) will continue to function as a **Community of Practice**, supporting mutual learning and policy alignment.

4.7.2 Asset-Specific Sustainability Plans

Table 2 - Asset-Specific Sustainability Plans

KER	Lead Maintenance Role	Sustainability Actions
digital twin toolbox	VCS, municipal IT units	Codebase maintained under open license (e.g. EUPL), with governance board for versioning
AI impact models	FIC, POLIMI, ENG	Hosted on institutional servers; planned integration in AI4Cities and sister projects

co-creation methodology	URBASOFIA, LC	Translated into training modules; hosted on partner websites; included in EU capacity-building calls
KPI dashboards and monitoring tools	VITO, city sustainability teams	Handed over to pilot city teams; part of digital twin integration roadmap
replication toolkit and playbooks	CA, DBC, BLOXHUB	Packaged for reuse in EU Mission clustering and European Urban Initiative (EUI) - funded urban partnerships

These sustainability actions are aligned with WP8 Task 8.6 and the outcomes expected in the final version of the business and commercialisation plan (D8.7).

4.7.3 Timeline and Milestones

The sustainability roadmap foresees the following progression:

- **M42–M48:** Consolidation of KER documentation, transfer of ownership and internal agreements on roles/responsibilities.
- **M48+:** Entry into scaling and post-project exploitation phase. This includes
 - joint funding applications by partners (e.g. FRC + SME + RTO consortia),
 - integration in public procurement pipelines of pilot cities,
 - participation in policy working groups (e.g., Mission Cities, Living-in.EU), and
 - launch of replication activities in new cities through the replication playbook.

4.7.4 Long-Term Vision

URBREATH’s long-term vision is to contribute to the development of a distributed, replicable and scalable European ecosystem for regenerative, nature-based and digitally enabled urban transformation. This vision rests on:

- A network of URBREATH Legacy Centres (at least one per FRC) supporting local implementation, monitoring and citizen engagement.
- The formation of an open repository of URBREATH assets, linked to platforms such as CORDIS, Zenodo and EU Mission data portals; as well as
- A lightweight governance mechanism (e.g. informal alliance or legal consortium) that preserves collective ownership, provides support to newcomers and steers updates of methodologies and tools.

This approach ensures that URBREATH is not a closed project but an evolving platform, capable of adapting to future policy priorities, technological trends and societal needs.

4.8 Risk Analysis and Mitigation

A critical element of the URBREATH business and sustainability planning process is the early identification of strategic risks that may affect the uptake, scalability and long-term use of its KERs. This section presents a stable version of the project’s exploitation-related risk matrix, along with corresponding mitigation strategies. Risks have been classified across four categories: technological, organisational, financial and regulatory/market related.

The risk analysis integrates insights from partner self-assessments, stakeholder feedback and the exploitation survey conducted under Task 8.4. The focus is not only on risks to commercialisation but also on risks affecting public-sector exploitation, institutional embedding and post-project maintenance.

4.8.1 Exploitation Risk Matrix

Table 3 - Exploitation Risk Matrix

Risk Category	Risk Description	Likelihood	Impact	Mitigation Strategy
Technological	Lack of interoperability between URBREATH digital tools and existing city systems	Medium	High	Early API documentation; alignment with open standards (OGC, INSPIRE); sandbox testing with FRCs
Technological	Insufficient TRL or usability of AI models for real-time application	Low-Medium	Medium	Focus on modular, explainable AI; pilot validation with climate data before final release.
Organisational	Unclear post-project ownership of key tools and methods	High	High	Formal internal agreements on asset custodianship; sustainability assignments in WP8
Organisational	Fragmented exploitation paths due to differing partner interests	Medium	High	Joint exploitation plan; clustering similar KERs into joint offerings (toolboxes, services)
Financial	Lack of follow-up funding for maintenance, deployment or replication	Medium	High	Identification of relevant EU, national and private financing sources (e.g. EUI, LIFE, Connecting Europe Facility (CEF) Digital)

Risk Category	Risk Description	Likelihood	Impact	Mitigation Strategy
Market/Policy	Misalignment between URBREATH offerings and emerging policy needs (e.g., taxonomy, New European Bauhaus - NEB)	Medium	Medium	Continuous policy monitoring; adaptation of messaging and business models to new policy priorities
Market/Policy	Low city readiness for systemic NBS-based approaches or digital twin integration	Medium	Medium	Capacity building via replication toolkit and training; alignment with EU Missions to boost demand
Legal/Regulatory	Uncertainty in data ownership and licensing of project outputs	Low	Medium	Early legal assessment; open licensing strategy where feasible (e.g., Creative Commons, EUPL)

4.8.2 Mitigation Framework

To operationalise the above strategies, URBREATH has adopted the following framework:

- **Asset Ownership Clarification:** Each major KER is assigned a primary owner and supporting partners. Legal responsibilities and licensing intentions are recorded.
- **Exploitation Clustering:** Thematic clustering of results (e.g., all digital tools, all participatory methods) facilitates coherent packaging, scalability and partner coordination.
- **Dynamic Market Fit Monitoring:** Regular updates (e.g. in D8.6 and D8.7) will adjust exploitation scenarios to reflect new trends in climate policy, urban digitalisation and funding.
- **Funding and Procurement Watchlist:** A live matrix of relevant funding calls, procurement pilots and partner pipelines is maintained, enabling rapid response to opportunities.
- **Sustainability Assignments:** For each asset critical to long-term impact, sustainability custodians (institutions responsible for future support/maintenance) are identified.

URBREATH acknowledges that innovation inherently involves risk. However, the project's multi-stakeholder, multi-phase structure allows for adaptive learning, ongoing validation and strategic alignment. The risk analysis presented here will feed into the final Commercialisation Action Plan (D8.7), where mitigation measures will be further refined.

4.9 Collaboration and Scaling Mechanisms

The long-term success of URBREATH hinges on its ability to create conditions for replication, uptake and systemic embedding of its tools, methods and outcomes across Europe. Rather than relying solely on direct commercial routes, URBREATH emphasizes collaborative scaling mechanisms, designed to enable both institutional adoption and market-oriented growth through partnerships, networks and coordinated deployment pathways.

This section outlines the mechanisms through which URBREATH results will be scaled up and out—beyond the original consortium and pilot locations—focusing on four interrelated strategies: replication, policy alignment, clustering and capacity building.

4.9.1 Replication Pathways via Follower Cities

A cornerstone of URBREATH’s scaling model is the structured engagement of Follower Cities, which serve as real-life testbeds for adaptation and contextualisation of URBREATH tools and methods. The replication mechanism includes the following:

- Co-design and testing of the Replication Toolkit (KER5), developed to guide cities through context-sensitive adoption of Digital Twins, co-creation approaches and NBS strategies.
- Development of city-specific roadmaps based on lessons from the Frontrunner Cities (FRCs).
- Cross-city mentoring and capacity exchange between FRC-FLC pairs based on climatic zone affinities and thematic focus (e.g. urban agriculture, public health, digital planning).
- Evaluation of FLC progress using a standardised set of KPIs and feedback loops to refine the toolkit and support wider dissemination.

These replication pathways are expected to extend URBREATH’s reach beyond the initial nine cities, serving as an entry point for further European municipalities interested in systemic climate resilience strategies.

4.9.2 Policy and Mission Alignment

URBREATH actively aligns its outputs and engagement activities with major EU and global urban innovation initiatives, including:

- Mission 100 Climate-Neutral and Smart Cities, with which several URBREATH cities are already affiliated.
- The New European Bauhaus (NEB) initiative, through its emphasis on inclusive, sustainable and aesthetic transformation.
- The European Urban Initiative (EUI) and NetZeroCities Platform, which offer funding and visibility for integrated urban innovation.

Alignment is supported through:

- Use of EU-standard indicators and reporting formats (e.g. for climate impact and stakeholder engagement).
- Policy dialogues and sessions organised jointly with other projects funded under Horizon Europe Missions.
- Proactive participation in consultation processes for EU urban policy instruments and standards.

This approach ensures that URBREATH results remain policy-relevant, fundable and scalable through institutional channels.

4.9.3 Clustering with EU-funded Projects and Platforms

URBREATH fosters synergies with related Horizon Europe and Horizon 2020 initiatives through formal clustering activities. This includes:

- Participation in thematic clusters (e.g. digital twins, urban greening, climate services).
- Joint sessions at EU events (e.g. European Week of Regions and Cities, Smart City Expo, European Climate Change Adaptation Conference).
- Contribution to shared repositories and toolkits, including through Mission Platforms, the Joint Research Centre (JRC) Urban Data Platform, and the upcoming Destination Earth (DestinE) initiative.
- Co-development of minimum interoperability frameworks with members of OASC and Living-in.EU.

This ecosystem approach reinforces URBREATH's role as part of a broader innovation wave rather than a standalone initiative.

4.9.4 Capacity Building and Community of Practice

To ensure long-term scaling, URBREATH supports the formation of a Community of Practice (CoP), bringing together cities, researchers, practitioners and policy actors around systemic urban regeneration.

Capacity building mechanisms include:

- Open-access toolkits, handbooks and online tutorials (e.g. for LDT integration or co-creation facilitation).
- Peer-learning events, including webinars, policy labs and urban innovation workshops.
- Certification schemes or training-of-trainers formats for use by cities or technical providers.

The CoP model supports bottom-up diffusion and creates conditions for self-sustaining scaling, independent of the project's funding timeline.

Through this blend of top-down and bottom-up mechanisms, URBREATH aims to transform scaling from a linear process (tool-to-user) into a distributed, multi-actor strategy—where tools, methods and policy frameworks co-evolve across diverse urban contexts.

4.10 Conclusions and Next Steps

The stable version of the URBREATH Business Plan and Sustainability Model presented in this section marks a significant step toward the structured exploitation, long-term viability and large-scale uptake of the project's results. Drawing on a diverse set of KERs, the plan establishes a comprehensive roadmap that reflects both the technological innovation and the systemic, participatory transformation at the heart of the URBREATH vision.

The analysis confirms that the URBREATH offering—spanning digital twins, AI-driven impact modelling, participatory co-creation methodologies and monitoring frameworks—meets an emerging market demand for integrated Resilience-as-a-Service solutions. Through its focus on climate neutrality, citizen

engagement and nature-based urban regeneration, the project positions itself not as a single product line, but as a modular ecosystem of capabilities supporting both commercial and public-sector actors. Several key conclusions emerge:

- **Diversified Business Models:** KERs are best exploited through a blend of business models, including SaaS, consultancy, open-access toolkits, public procurement integration and replication support. Each model reflects the nature of the result and the profile of the exploiting partner(s).
- **Institutional Embedding and Policy Alignment:** The URBREATH approach aligns strongly with current EU policy frameworks (e.g. EU Missions, Green Deal, New European Bauhaus), creating direct routes for public sector uptake and enabling long-term impact through institutional mechanisms.
- **Sustainability Structures in Place:** Key roles for maintenance, governance and further development have been assigned. Open licensing, platform documentation and partner stewardship models will support continuity after the project.
- **Collaborative Scaling is Underway:** Replication through Follower Cities, clustering with related projects, and active participation in EU platforms position URBREATH for systemic diffusion and cross-context adaptation.
- **Risks are Known and Managed:** Core risks—including technological integration, stakeholder fragmentation, and funding discontinuity—have been identified, with mitigation actions embedded in the exploitation strategy.

Next Steps (towards D8.6 and D8.7)

The exploitation team will now enter the final phase of the business planning and commercialisation process, leading to Deliverables D8.6 (Commercialisation Progress Report) and D8.7 (Final Business and Exploitation Plan). The main priorities for this period include:

- Refining individual exploitation plans with updated partner inputs, including timelines, licensing strategies and commercialisation actions.
- Validating financial and operational projections for selected KERs where commercial routes are being actively pursued (e.g. digital twins, AI models, replication services).
- Updating the commercialisation action plan with a focus on partner pipelines, market entry preparation and packaging of results.

Through these actions, URBREATH will ensure that its outcomes do not remain confined within the boundaries of a funded project, but are translated into living, evolving instruments of change across European urban landscapes.

5 Market and Competition Updates

This section analyses the global and European market for urban transformation, concluding that the non-negotiable drivers of climate change and rapid urbanisation are forcing the convergence of four previously distinct technology markets: Nature-Based Solutions (NBS), Urban Digital Twins (UDTs), high-resolution environmental modelling, and AI-driven analytics. This convergence is creating a new, integrated "urban resilience" sector. A single best-in-class product will not define market leadership from 2024 to 2030, but by the ability to provide a unified "Resilience-as-a-Service" (RaaS) platform.

Key market dynamics reveal a "digital-to-physical" imbalance. High-growth digital enablers—such as the Climate Tech market (projected to grow at a 20.9% CAGR; Grand View Research, 2025a) and the AI in Urban Planning market (projected to grow at a 20.7% CAGR; Knowledge Sourcing Intelligence, 2025)—are expanding at twice the pace of the capital-intensive physical solutions market. The Climate Adaptation market, which includes NBS, shows a more modest 10.5% CAGR (Grand View Research, 2025b). This suggests that the primary market opportunity lies in utilising advanced digital tools to overcome the bottlenecked physical market. The value of UDTs, for instance, is measured by the massive cost savings they generate, projected to be USD 280 billion by 2030 (ABI Research, 2025).

The competitive landscape is rapidly consolidating into a "platform war." This battle puts enterprise incumbents—such as Siemens (Digital Engineering 24/7, 2025), Dassault Systèmes (Dassault Systèmes, 2025) and Bentley Systems (Smart DCU, 2025)—against a dynamic ecosystem of specialised innovators like NatureMetrics and Digital Blue Foam (World Economic Forum, 2022; Digital Blue Foam, 2025) creating the niche "apps" that run on these platforms.

The primary barriers to adoption are no longer technological but are centred on governance. These include navigating the complex new regulatory landscape of the EU AI Act and GDPR (MDPI, 2025), overcoming institutional data silos through new governance models (Sverhulst, 2025) and closing the vast municipal skills gap in data science and climate adaptation (Beacon Research Project, 2023).

The chief strategic opportunity for market leaders is to turn these barriers into a product. This includes offering "Compliance-as-a-Service" modules to navigate EU AI Act requirements (Pinsent Masons, 2025) and leveraging AI-powered UDTs as "project origination" tools to generate the "bankable" NBS projects (UNEP CCC, 2025) that public-private financing bodies, like the Natural Capital Financing Facility (European Commission, 2016), are actively seeking.

5.1 The Global and European Urban Transformation (2030–2050): The Climate Resilience Imperative

Contemporary urban transformation is not a choice but a necessity, driven by a set of compounding crises that have shifted the rationale for technology adoption from a "smart city" luxury focused on efficiency to a "survivable city" mandate focused on resilience.

5.1.1 The Compounding Crises: Urbanisation and Climate Exposure

Three non-negotiable macro-trends are defining the market:

1. **Rapid Urbanisation:** The world is undergoing an unprecedented urban expansion. By 2050, the number of people living in cities is projected to reach five billion. This includes an addition of two billion new urban dwellers, pushing the global urbanisation rate to approximately 70% (ESPAS, 2025; UNDRR, 2025). This massive influx places unprecedented strain on all urban systems, including housing, mobility, public health and basic infrastructure (UNDRR, 2025).
2. **Acute Climate Impacts:** This urbanisation is occurring on a planet that is demonstrably "hotter," a recognised global mega-trend (ESPAS, 2025). This has severe, localised consequences for cities:
 - **Extreme Heat:** By 2030, an estimated 1.9 billion urban citizens will be subject to significant heat stress. By 2050, this number climbs to 1.6 billion people across 970 cities who will be regularly exposed to extreme high temperatures (UNDRR, 2025; World Bank, 2025a). This makes the mitigation of the Urban Heat Island (UHI) effect a primary driver of public health and safety (World Bank, 2025b).
 - **Flooding and Disasters:** By 2050, over 800 million people residing in 570 cities will be vulnerable to sea-level rise and coastal flooding (World Bank, 2025a). The financial exposure is already staggering; a single year of weather-related disasters recently caused EUR 283 billion in economic damages (BCG, 2024).
3. **Intensive Resource Strain:** The convergence of urbanisation and climate change creates an unsustainable demand for resources. By 2030, global demand for food, water and energy is expected to increase by 35%, 40% and 50%, respectively (BCG, 2024). Cities, which already consume 75% of the world's energy and produce 70% of its CO₂ emissions (ESPAS, 2025), are the epicentre of this crisis. Existing systems, such as urban mobility, are already failing, with over 90% of the urban population breathing air that does not meet WHO health standards (UNDRR, 2025).

These drivers have fundamentally changed the procurement narrative. The "why" for investing in advanced urban technology is no longer a CTO's budget for "efficiency" (e.g., smart parking) but a mayoral mandate for "resilience and public safety" (ESPAS, 2025).

5.1.2 The European Response: The World's Largest "Innovation Hub"

The European Union has responded to this imperative with a deliberate, large-scale industrial policy. The *EU Mission for 100 Climate-Neutral and Smart Cities by 2030*, a core pillar of the European Green Deal, is the single most significant market-shaping force in this sector (European Commission, 2025a; ERRIN, 2025).

This mission is not merely a climate target; it is an explicit economic strategy. The 112 cities selected are mandated to act as "experimentation and innovation hubs" (NetZeroCities, 2025). These hubs are designed to test, deploy and validate cross-sectoral solutions (e.g., in energy, transport, buildings) with the expressed goal of creating a proven playbook that all European cities can follow to achieve climate neutrality by 2030 (European Commission, 2025b).

The mission is operationalised through *Climate City Contracts*—roadmaps co-created with local stakeholders that also function as investment plans (European Commission, 2025a).

For technology providers, this EU-led structure is a profound market-making strategy. It solves the three fundamental challenges of the fragmented, high-risk municipal (Business-to-Government) market:

1. **It aggregates demand:** It bundles 112 cities into a single, cohesive market block.
2. **It de-risks innovation:** It provides a shared research and innovation agenda and facilitates access to EU funding, reducing the cost of experimentation (European Commission, 2025b).
3. **It creates demand:** The *Climate City Contracts* function as de facto purchase orders, clearly articulating the demand for new solutions (European Commission, 2025a).

This industrial policy is designed to utilise European cities as a scalable testbed for building a world-leading technology sector.

Table 4 - The Urban Resilience Imperative: Key Drivers and Projections (2030-2050)

Macro-Trend	Key Metric/Projection	Implication for Urban Systems
Urbanisation	70% of the global population will be in cities by 2050 (2 billion new urban dwellers).	Massive, systemic strain on all infrastructure (housing, mobility, waste, water).
Climate: Extreme Heat	1.6 billion people in 970 cities will be exposed to regular extreme heat by 2050.	UHI mitigation and public health adaptation become non-negotiable public safety issues.
Climate: Flooding	800 million people in 570 cities are vulnerable to sea-level rise by 2050.	Catastrophic financial risk; drives demand for resilient infra and NBS.
Resource Strain	By 2030: +50% energy demand, +40% water demand	Mandates a shift to circular economy models and extreme resource efficiency.
Policy Response	EU 100 Climate-Neutral and Smart Cities Mission.	Creates a 112-city "innovation hub" to de-risk and scale new technologies.

5.2 Market Segmentation and Growth Analysis (2024–2030): The Resilience Technology Stack

An analysis of the component markets reveals a critical "digital-to-physical" imbalance. Digital enabling technologies are growing at twice the rate of physical solution technologies. Specifically, the "Climate Tech" market (primarily digital) shows a 20.9% CAGR (Grand View Research, 2025a), and the "AI in Urban Planning" market is at a 20.7% CAGR (Knowledge Sourcing Intelligence, 2025). In contrast, the "Climate Adaptation" market, which encompasses physical-world NBS, is projected at a 10.5% CAGR (Grand View Research, 2025b).

This divergence indicates that the physical NBS market is "stuck," constrained by significant barriers to finance, scalability and economic justification (UNEP CCC, 2025; ICLEI, 2025). The single most significant market opportunity, therefore, is using the high-growth digital technologies (AI/UDTs) to unlock the lower-growth, bottlenecked physical market (NBS).

A. Nature-Based Solutions (NBS)

- **Market Definition:** NBS are solutions "inspired and supported by nature" that provide environmental, social, and economic benefits (European Commission, 2025c). In the urban context, this includes green roofs, constructed wetlands, urban forests and permeable surfaces designed to mitigate UHI, manage stormwater and restore biodiversity (World Bank, 2025a).
- **Market Size and Growth:** As a key segment of the global "Climate Adaptation Market," this sector is projected to grow from USD 25.45 billion (2023) to USD 51.24 billion (2030), reflecting a 10.5% CAGR (Grand View Research, 2025b).
- **The Core Challenge: Financing and Scalability:** The modest growth relative to digital tech stems from financing barriers. Stakeholders report a "scarcity of bankable projects" (UNEP CCC, 2025), difficulty demonstrating clear economic returns (ICLEI, 2025), fragmented municipal governance, and a lack of standardised assessment methods for scaling solutions beyond local pilots (EEA, 2025).
- **Financing Mechanisms:**
 1. **Blended Finance (EU):** The Natural Capital Financing Facility (NCFF), a joint initiative of the European Investment Bank (EIB) and the European Commission, provides EUR 100–125 million funds for green infrastructure through direct debt and technical assistance (European Commission, 2016).
 2. **Public-Private Partnerships (PPPs):** These long-term contractual arrangements share risks and are essential for leveraging private capital (EEA, 2025).
 3. **Tax Incentives:** For instance, Mexico City's 10% property tax reduction for green roofs resulted in over 22,000 sq. metres of new green space (ICLEI, 2025).
 4. **Bonds:** Municipal green bonds—like the Netherlands' sovereign bond and the "Miami Forever Bond"—are promising financing avenues (World Bank, 2018).
- **Case Study (Financial ROI):** Copenhagen's "Cloudburst Plan" was initiated after a 2011 flood caused EUR 1 billion in damage. The city's Climate Adaptation Plan prioritised NBS, such as permeable surfaces and green networks. This approach reduced costs by over USD 200 million compared to traditional grey infrastructure (Ellen MacArthur Foundation, 2025).
- **Case Study (Financing Mechanism):** In Athens, a EUR 5 million NCFF loan helped implement UHI-mitigation projects like greening public squares and restoring Lycabettus Hill, demonstrating tangible city-scale NBS financing (EIB, 2025).

B. Urban Digital Twins (UDTs) and High-Resolution Modelling

- **Market Definition:** UDTs are dynamic, data-driven 3D replicas of cities. They are "connected ecosystems" that integrate real-time data from IoT sensors, GIS and models to simulate and test urban plans before implementation (Deloitte, 2025; ABI Research, 2025).
- **Market Size and Growth:** Rather than direct software revenue, the value of UDTs is measured in cost savings. ABI Research estimates that USD 280 billion in cost savings will be achieved by 2030 through the adoption of digital twins in cities (ABI Research, 2025).
- **Enabling Technology:** High-resolution environmental models (e.g., thermal, hydrodynamic) are critical components. UDTs use these to simulate environmental conditions at the street level. A

significant initiative in this area is the EU’s Destination Earth (DestinE), which aims to build digital twins of the planet (ECMWF, 2025).

- **Case Study (Implementation):** In Dublin, the City Council collaborates with academic institutions like ADAPT and ICHEC and tech providers like Bentley Systems to create a digital twin platform. The city has even designated a "Digital Twin Ecosystem Manager" role (Maynooth University, 2025; Smart DCU, 2025).

C. AI-Driven Analytical Tools

- **Market Definition:** This is the “intelligence layer” of the UDT. AI transforms static urban models into predictive engines that simulate and optimise scenarios (Digital Blue Foam, 2025).
- **Market Size and Growth:** The "AI in Urban Planning" market is expected to grow from USD 24.84 billion in 2025 to USD 63.72 billion by 2030, at a 20.7% CAGR (Knowledge Sourcing Intelligence, 2025).
- **Key Applications:** These include infrastructure failure prediction, generative design scenarios and optimising services like waste, energy and transport (UP2030, 2025; Deloitte, 2025).
- **Case Study (Platform ROI):** Cascais, in Portugal, implemented Deloitte’s CitySynergy platform, creating a "Digital Command Centre" that integrates city-wide data. Results include a 40% reduction in waste management costs and annual savings of EUR 900,000. In mobility, 10–27% cost savings are projected due to better system optimisation (Deloitte, 2025).

Table 5 - Comparative Market Analysis: The Urban Resilience Tech Stack (2024-2030)

Technology Segment	Market Size (2024)	Projected Size (2030)	CAGR (2024-30)	Primary Value Metric	Key Growth Drivers	Key Barriers
Nature-Based Solutions (NBS) (as part of Climate Adaptation)	~USD 25.45 B (2023)	USD 51.24 B	10.5%	Project revenue	Climate mandates; UHI/flood risk; proven ROI (e.g., Copenhagen).	Lack of "bankable" projects; scalability; fragmented governance.
Urban Digital Twins (UDTs)	N/A (Feature-based)	USD 280 B	N/A	Cost savings	Need for simulation; infrastructure complexity; public engagement demands.	Data silos; interoperability; high initial cost; governance.

Technology Segment	Market Size (2024)	Projected Size (2030)	CAGR (2024-30)	Primary Value Metric	Key Growth Drivers	Key Barriers
High-Res Modelling	N/A (Enabling Tech)	N/A	N/A	Model accuracy	Inadequacy of global models; EU DestinE initiative.	Computational cost; data availability; validation.
AI-Driven Analytics (in Urban Planning)	~USD 24.84 B (2025)	USD 63.72 B	20.73%	Software/service revenue	Demand for predictive optimisation; proven ROI (e.g., Cascais).	EU AI Act; skills gap; data access (GDPR).

5.3 Competitive Landscape

The market for urban resilience technology is consolidating into a classic "platform war". The central competitive dynamic is no longer centred on single-point solutions but on establishing the foundational "urban operating system" (Digital Engineering 24/7, 2025). Large enterprise incumbents are racing to build this OS, creating a "system of systems" designed to dominate the ecosystem and compel specialised innovators to develop "apps" that run on their platforms via APIs. This approach mirrors the "app store" model, where the platform owner captures a share of all value flowing through the ecosystem (Siemens, 2025).

A. Enterprise Platform Incumbents (The "Integrators")

- **Siemens**
 - **Strategy:** Siemens pursues "Full-Stack Integration" by leveraging its dual role as a provider of both smart physical infrastructure and digital software for management (Siemens, 2025).
 - **Showcase:** *Siemensstadt Square* is a 76-hectare redevelopment project in Berlin, designed as a carbon-neutral "city of the future". The project functions as a living lab for Siemens' UDT platform, integrating a Building Twin, Energy Twin, and Campus Twin (Bentley Systems, 2025). The initiative is co-developed with partners, including Bentley Systems (Bentley Systems, 2025).
- **Dassault Systèmes**
 - **Strategy:** Competing through scientific precision, Dassault promotes its "Science-Based Virtual Twin" strategy via the 3DEXPERIENCE platform (Dassault Systèmes, 2025).
 - **Showcase:** In partnership with SUEZ and EGIS, the *Virtual Twin of Cairo* aims to address climate adaptation by optimising urban green space placement down to street-level

precision—including species-level tree recommendations for optimal environmental impact (Dassault Systèmes, 2025).

- **Bentley Systems**

- **Strategy:** Bentley emphasises its dominance in the Architecture, Engineering, and Construction (AEC) sector with its “Infrastructure Ecosystem” approach.
- **Showcase:** Bentley’s iTwin platform underpins the Smart Dublin and Smart programme at Dublin City University (DCU) and the broader Smart Dublin ecosystem, connecting Computer-Aided Design (CAD) and Building Information Modelling (BIM) design data to real-time urban operations via UDTs (Smart DCU, 2025).

- **Other Key Incumbents:** Hexagon AB, in collaboration with NVIDIA, integrates high-fidelity visualisation through the NVIDIA Omniverse (Hexagon, 2025). Other major software firms, including SAP, Oracle, PTC (model-based enterprise), and Autodesk (CAD), are also positioning their platforms as central Urban Operating Systems (Siemens, 2025).

B. Specialised Innovators & Disruptors (The "Specialists")

The platform war opens rather than closes space for startups. Integrators depend on an ecosystem of niche “apps” to increase the value of their platforms. These “Specialists” are not competing directly with incumbents like Siemens—they are building the critical functionalities that will run on the urban OS.

- **NBS Data and Intelligence (The "Data Layer")**

- **NatureMetrics:** Delivers nature intelligence through eDNA-based biodiversity monitoring, providing verifiable metrics to validate the ecological impact of NBS (World Economic Forum, 2022).
- **Space Intelligence:** Applies satellite imagery and AI to monitor forest cover, habitats, and carbon stock—key for evaluating NBS success (World Economic Forum, 2022).

- **Digital Twin and AI Startups (The "Analytics Layer")**

- **Digital Blue Foam:** A leading example of a specialist offering synergy-based solutions, using AI to assign “resilience scores” that guide optimal placement of green infrastructure (Digital Blue Foam, 2025).
- **blackshark.ai:** Secured USD 35 million in funding to develop advanced 3D digital twin technology, reflecting strong investor interest (StartUs Insights, 2025).
- **Twinsity:** Offers drone-enabled digital twins and AI-assisted structural damage analysis, expanding UDT capabilities in infrastructure resilience (StartUs Insights, 2025).
- **VividGrd:** Focuses on energy-related digital twins for monitoring, optimisation and energy trading (StartUs Insights, 2025).

Table 6 - Competitive Landscape: Key Players in Urban Resilience Technology

Company	Category	Key Platform/ Solution	Core Strategy and Competitive Advantage	Example Use Case
Siemens	Incumbent / Integrator	Siemensstadt Platform	Full-Stack Integration: Connects physical smart infrastructure (grids, buildings) with their digital twin management layer.	Siemensstadt Square: A living lab and showcase for its "Building Twin" and "Energy Twin".
Dassault Systèmes	Incumbent / Integrator	3DEXPERI- ENCE Platform	Science-Based Virtual Twin: High-fidelity, physics-based simulation for deep environmental and "what-if" analysis.	Virtual Twin of Cairo: Optimising green space and tree-species placement to mitigate heat islands.
Bentley Systems	Incumbent / Integrator	iTwin Platform	Infrastructure Lifecycle Ecosystem: Dominance in AEC; integrates data from design (CAD/BIM) to operations (UDT).	Smart Dublin: Serving as the core platform partner for the city's UDT ecosystem.
Hexagon AB	Incumbent / Integrator	Smart Digital Realities	High-Fidelity Visualisation: Partnered with NVIDIA Omniverse to blend real-world capture with digital twin simulation.	Urban planning and reality capture for immersive digital twins.
Digital Blue Foam	Specialist / Innovator	Digital Blue Foam Platform	AI-Driven Design: Productises the synergy, offering "resilience scoring" to optimise green infrastructure placement.	Aiding planners in designing climate- resilient neighbourhoods from the concept stage.
NatureMetrics	Specialist / Innovator	eDNA Monitoring Services	Biodiversity Data-as-a- Service: Provides the "proof" for NBS by quantifying biodiversity gains via DNA analysis.	Measuring the ecological impact and success of a wetland restoration project.

5.4 The Synergy Framework: Integrating Technologies for Competitive Advantage

Market leadership in the urban resilience sector will not be achieved through the dominance of any single technology but through their effective integration. The four core technologies Nature-Based Solutions (NBS), Urban Digital Twins (UDTs), high-resolution environmental modelling and AI-driven analytics form a mutually reinforcing system, resulting in a high-value "Resilience-as-a-Service" (RaaS) offering (ECMWF, 2025; Digital Blue Foam, 2025).

This integrated framework constitutes the ultimate competitive advantage, transforming the conversation from "what if" to "how" and "how much". The UDT, powered by high-resolution environmental models (ECMWF, 2025), provides a virtual testbed where cities can simulate urban plans before implementation (ABI Research, 2025). Artificial intelligence then acts as the predictive engine, integrating real-time data with environmental simulations (Smart DCU, 2025). This AI-enhanced UDT is capable of optimising the design, siting and expected impact of NBS interventions (World Economic Forum, 2022).

This synergy shifts urban planning from guesswork to precision—allowing planners to quantify which interventions (e.g., urban forests, green roofs) offer the highest return on cooling, water retention or flood mitigation per euro invested. The European Commission explicitly supports this integrated model, funding research into “the integration and orchestration of developed models... applied in different urban domains (e.g., infrastructure planning, including nature-based solutions...)” (European Commission, 2025d).

A. The Predictive Framework in Practice: From Data to Decision

This integrated approach can be operationalised in a three-step loop:

- **Step 1: Create the Virtual Testbed (UDT + Modelling).** The UDT is enhanced through high-resolution hydrodynamic (flood) and atmospheric (heat) modelling (EEA, 2025). Foundational data from platforms like the EU’s Destination Earth initiative is incorporated to produce a “dynamic, virtual representation” of the city’s infrastructure and environmental systems (ECMWF, 2025).
- **Step 2: Run the Predictive Brain (AI Analytics).** Artificial intelligence is applied to the virtual testbed created in Step 1 to conduct resilience scoring and scenario analysis (Digital Blue Foam, 2025). This includes simulating extreme weather events and assessing their potential impacts on critical infrastructure and vulnerable populations (UP2030, 2025).
- **Step 3: Optimise the Physical Solution (NBS).** The insights derived from AI models guide the placement and design of NBS. These tools can quantify the predicted effect of urban forests (World Bank, 2025a) or constructed wetlands (ICLEI, 2025), thereby de-risking NBS investments, demonstrating their financial viability, and producing the metrics needed to make these projects "bankable" for investors.

B. Case Studies in Synergy

- **Dassault Systèmes in Cairo:** This project illustrates the complete synergy framework. The UDT acts as a climate observatory, while its AI-powered platform identifies urban heat islands and

simulates the effects of different greening strategies. It even recommends ideal tree species based on predicted benefits in cooling and air quality (Dassault Systèmes, 2025).

- **Venice and Sydney (Predictive Framework):** A 2025 study highlights how the integrated predictive framework was applied in Venice and Sydney (Digital Engineering 24/7, 2025). In Venice, the UDT simulates sea-level rise and optimises both complex (flood barriers) and soft (wetland restoration) adaptation measures. In Sydney, neighbourhoods are ranked by climate vulnerability to prioritise NBS investments, such as green pavements and vegetated buffers.
- **Digital Blue Foam Platform:** This company exemplifies the synergy framework by integrating AI within a UDT to assign “resilience scores” to urban design options. The platform directly supports decisions on where to place green infrastructure for maximum resilience impact (Digital Blue Foam, 2025).

5.5 Critical Barriers to Market Adoption and Scale

Despite the clear technological potential and favourable market dynamics, the adoption of urban resilience technologies is constrained by formidable, non-technical barriers. These include regulatory, governance and financial hurdles, which now represent the most significant risks for providers—and the greatest opportunities for those who can solve them (European Commission, 2024; EEA, 2025; World Economic Forum, 2022).

A. Regulatory and Policy Hurdles (The “New” Problem)

The European Union presents a central paradox: it is simultaneously the most ambitious promoter of the smart city market, via initiatives like the 100 Climate-Neutral and Smart Cities Mission (European Commission, 2023), and a major driver of complex regulatory requirements for data, AI and procurement – some of which are summarised in the points below.

- **The EU AI Act:** As of 2024, the EU Artificial Intelligence Act has entered into force, imposing a strict risk-based regulatory regime. AI systems that govern “critical sectors” or “affect fundamental rights” are designated as “high-risk” (European Commission, 2024). Given that urban planning impacts core public functions such as energy management, mobility and public safety, AI systems used in these domains clearly fall under this high-risk classification (Veale & Borgesius, 2021). This triggers substantial compliance requirements, including risk assessments, data governance protocols, human oversight, transparency mandates and ongoing monitoring (Kaminski et al., 2022). These obligations translate into significant “compliance costs,” which deter adoption—particularly by risk-averse public procurement bodies (Brkan, 2021).
- **The GDPR Conflict:** There is an inherent legal tension between AI/UDT systems and the General Data Protection Regulation (GDPR).
 - **Purpose Limitation vs. Data Fusion:** GDPR’s “purpose limitation” principle requires that personal data be used only for the purpose for which it was initially collected (Voigt & Von dem Bussche, 2017). However, UDTs and platforms like Deloitte’s CitySynergy thrive by fusing data from disparate domains (e.g., traffic, waste, health) to uncover cross-cutting patterns—potentially violating this core GDPR principle (Deloitte, 2024).

- **Data Minimisation vs. Model Accuracy:** GDPR also mandates data minimisation, requiring systems to collect only what is strictly necessary (Voigt & Von dem Bussche, 2017). This principle clashes with AI methodologies—especially machine learning and deep learning—which perform better with more data (Brkan, 2021).

The result is legal uncertainty and data access limitations, which inhibit innovation and slow deployment (Kaminski et al., 2019).

B. Governance, Financial and Implementation Hurdles (The “Old” Problem)

Beyond regulatory constraints, persistent bureaucratic and financial challenges hamper progress.

- **Data Governance Chasm:** The most common operational failure point is poor data governance. Municipal agencies often operate in institutional silos, and data is frequently non-interoperable, fragmented and inaccessible—undermining the value proposition of UDTs, which rely on real-time, cross-domain data streams (Smart DCU, 2025; OECD, 2023). Privacy and security risks further exacerbate the challenge (EEA, 2025).
 - **Emerging Solution:** Innovative governance models offer a way forward. “Data Collaboratives”—which pool data across public-private-academic-civic partnerships for the common good (e.g., flood resilience)—are gaining traction (The GovLab, 2021). Another model is “Digital Self-Determination” or “AI Localism,” as implemented in Bologna, where citizens help decide how their data is used, thereby improving trust and legitimacy (Craglia et al., 2021).
- **The Municipal Skills Gap and Culture:** Cities remain under-resourced. A significant skills gap persists in areas such as data science and climate change planning (World Economic Forum, 2022). Municipalities often lack “Climate Change specialists” and are constrained by risk-averse organisational cultures that prioritise stability over innovation (OECD, 2023). Even when strategic urban resilience plans are developed, they frequently stall in the “planning-to-implementation gap” due to limited technical expertise and procurement capacity (EEA, 2025). This makes it challenging to manage and trust AI-driven systems (Kaminski et al., 2022).
- **The NBS Scalability and Financing Problem:** As previously discussed, NBS projects continue to struggle with scaling. They are difficult to justify economically due to the absence of standardised, quantifiable returns, and most fail to meet the “bankable project” criteria required for attracting large-scale public or private investment (ICLEI, 2025; World Economic Forum, 2022).

Table 7 - Analysis of Market Barriers and Mitigation Strategies

Barrier Category	Specific Barrier	Impact on Market	Emerging Mitigation / Market Opportunity
Regulatory (EU)	EU AI Act "High-Risk" Classification	Increases compliance cost, complexity and procurement time for AI in urban planning.	"Compliance-as-a-Service": Providers offer "compliance-ready" platforms that

Barrier Category	Specific Barrier	Impact on Market	Emerging Mitigation / Market Opportunity
			automate risk management and reporting.
Regulatory (EU)	GDPR Data Conflicts	Data access limitations that constrain or discourage data fusion.	Privacy-Enhancing Technologies (PETs) and new legal frameworks for data sharing (e.g., Data Act).
Governance	Data Silos & Interoperability	Starves UDTs of data; prevents holistic, "system-of-systems" analysis.	"Data Collaboratives" : Structured public-private partnerships to pool data for a shared, common-good purpose.
Financial (NBS)	Lack of "Bankable" NBS Projects	Slows growth of the physical adaptation market; investors and funds cannot deploy capital.	AI/UDT as "Project Origination" : Use synergy framework to model financial ROI of NBS, creating bankable assets.
Implementation	Municipal Skills Gap & Culture	"Planning-to-implementation gap"; cities lack expertise to procure or trust AI systems.	"Resilience-as-a-Service" (RaaS) : Abstract complexity into a subscription model focused on decision support, not just tools.

5.6 Strategic Outlook and Recommendations (2030–2050)

The analysis of market drivers, competitive landscape and critical barriers reveals a set of high-value strategic opportunities for technology providers, investors and public-sector partners.

A. Opportunity 1: The "Resilience-as-a-Service" (RaaS) Platform

The most significant market opportunity is to stop selling siloed point solutions—such as a UDT, an AI model or a modelling package—and instead offer a fully integrated, subscription-based *Resilience-as-a-Service* (RaaS) platform. The Cascais case study demonstrates the high value of an integrated digital command centre (Deloitte, 2024). This model directly addresses the municipal skills gap (World Economic Forum, 2022) by abstracting technological complexity and delivering actionable “decision support” instead of raw analytics. For providers, this creates predictable, recurring revenue streams. For municipalities, it converts a high-risk capital expenditure (CapEx) into a manageable operational expenditure (OpEx).

B. Opportunity 2: The "Compliance-as-a-Service" Module

The EU AI Act should be viewed as a market-making opportunity rather than merely a compliance burden. Providers who embed an AI-powered compliance module into their RaaS platform gain a competitive differentiator. This module would automate high-risk AI governance functions—such as risk management, data oversight, transparency logging and mandatory reporting (Kaminski et al., 2019). Public sector clients—particularly those constrained by risk-averse procurement systems—are expected to pay a premium for solutions that are “compliance-ready” and de-risk AI adoption (Veale & Borgesius, 2021).

C. Opportunity 3: The NBS "Project Origination" Tool

The most significant bottleneck in the climate adaptation space is the “scarcity of bankable NBS projects”, a financial problem, not a technological one (ICLEI, 2025). AI- and UDT-enabled platforms offer a solution by serving as financial origination tools. By modelling the return on investment and co-benefits of proposed NBS using the synergy framework (as discussed in Chapter 4), platforms can generate investment-grade, financeable projects that public funding vehicles (e.g., NCCFF; European Investment Bank, 2025) and private PPP investors (OECD, 2023) are actively seeking. The Copenhagen Cloudburst case, which demonstrated over USD 200 million in savings, offers a compelling blueprint (EEA, 2025).

D. Strategic Recommendation for Providers: Winning the Platform War

The optimal strategy in the European context is not to emulate a “closed ecosystem” like Apple’s iOS. Regulatory frameworks (European Commission, 2024) and governance needs (Craglia et al., 2021) render such models politically unviable. Instead, providers should strive to become the “integrator of choice” by:

- **Championing Open Standards:** Following the Smart Dublin model, this includes building interoperable platforms that enable secure collaboration among public agencies, private companies and citizens (Smart DCU, 2025).
- **Providing the Governance Framework:** Embedding “Data Collaborative” and “AI Localism” tools into the platform will help earn public trust and establish legitimacy (The GovLab, 2021; Craglia et al., 2021).

E. Strategic Recommendation for Investors: De-risking and Scaling

- **Follow the Policy:** The *EU 100 Climate-Neutral Cities Mission* is a government-backed market accelerator (European Commission, 2023). Investors should target companies (platform integrators and niche specialists alike) aligned with this mission. The selected 112 cities serve as regulatory safe zones and testbeds for scalable urban solutions.
- **Invest in the Enablers:** Digital “picks and shovels” such as UDTs and AI platforms are growing at 20.7% CAGR (Market Research Future, 2024), require less capital and are essential to unlocking the growth potential of the capital-intensive but stalled physical assets market, such as NBS (Statista, 2024).

5.7 Competitive Advantages of URBREATH Technologies

URBREATH possesses a set of distinct competitive advantages derived from its systemic integration of hybrid and NBS, advanced digital technologies and social innovation frameworks, all of which address critical market gaps identified in the urban transformation and climate adaptation sectors.

First, the project uniquely positions itself at the intersection of physical (NBS) and digital (AI, Digital Twins, environmental modelling) solutions, enabling a Resilience-as-a-Service (RaaS) paradigm. While the broader market exhibits a "digital-to-physical imbalance" with digital enablers growing at nearly double the rate of physical climate adaptation infrastructure, URBREATH's synergy framework directly addresses this gap by using AI-enhanced Urban Digital Twins to model and optimise NBS deployments. This integrated offering surpasses siloed competitors by translating high-resolution simulation and predictive analytics into quantifiable ROI, making NBS interventions "bankable" and thus more attractive to public-private financing mechanisms.

Second, URBREATH offers technological depth across multiple layers of innovation:

- Its digital twin solutions are not limited to visual representation but include fully integrated simulation, scenario testing and policy engagement mechanisms. This lowers the participation threshold for citizens and policymakers, enhancing both planning efficiency and democratic legitimacy.
- Its climate services and environmental modelling go beyond standard datasets by incorporating statistically downscaled seasonal forecasts, ensemble climate projections and customised Numerical Weather Prediction (NWP) corrections—enabling real-time and forward-looking urban resilience planning.
- It applies multi-scalar impact assessment tools that link engineering, environmental and socioeconomic dimensions through a modular and scalable framework. This provides unique capability in evaluating both direct and indirect impacts of NBS, something that most incumbent digital twin providers or standalone NBS projects lack.

Third, the project embeds co-design and stakeholder governance mechanisms directly into its technological stack. URBREATH's Living Labs (LLs) evolve into "co-design platforms for regenerative planning" that democratise access to planning tools and allow cross-actor interaction via intuitive interfaces (e.g., 3D UDTs with gamification and storytelling modules). This participatory design approach creates a differentiated user experience, fosters local ownership and increases the likelihood of sustained adoption and systemic impact.

Fourth, the project's multi-disciplinary innovation model incorporates cutting-edge research on the hybridisation of NBS with grey and engineered solutions. Unlike many EU-funded projects that treat hybridisation as a theoretical goal, URBREATH operationalises it through real deployments, performance monitoring (via novel scale-free indicators) and integration into planning frameworks applicable across diverse climatic and geographical zones. This results in scalable and transferable urban planning methodologies tailored to the realities of European cities.

Finally, URBREATH responds directly to the strategic thrust of the EU's 100 Climate-Neutral Cities Mission by serving as an enabler of industrial policy. It delivers replicable, city-level blueprints and innovation packages designed to be deployed across Follower Cities, thereby aligning with public

funding priorities and positioning the URBREATH consortium favourably within the regulatory and policy ecosystem.

5.8 Market Entry Challenges

Despite its strong alignment with market needs and EU policy priorities, URBREATH and similar integrated urban resilience platforms face several formidable market entry barriers, most of which are structural, regulatory or institutional rather than technical.

The most immediate challenge arises from the regulatory burden imposed by the EU Artificial Intelligence Act, which classifies AI systems in urban planning as “high-risk” technologies. URBREATH’s AI-driven decision support tools, while technically advanced, must comply with strict legal obligations including transparency, accountability, bias mitigation and human oversight. These regulatory requirements increase compliance costs and prolong procurement timelines, especially within the risk-averse public procurement environment of municipalities. This legal friction may delay or discourage adoption, particularly in smaller cities that lack the necessary legal or data governance capacity.

Second, GDPR compliance creates tensions for integrated digital systems such as Urban Digital Twins. The GDPR’s purpose limitation and data minimisation principles inherently conflict with the operational logic of UDTs, which rely on data fusion and maximal data ingestion for accuracy and predictive power. Without robust privacy-enhancing technologies (PETs) and legal harmonisation, cities may underutilise or avoid full deployment of these systems, limiting market uptake and ecosystem growth.

A third major challenge lies in the fragmentation of data governance across municipal systems. Cities often suffer from institutional silos, low data interoperability and limited in-house capacity to manage complex data flows. These factors directly undermine the value proposition of URBREATH’s cross-domain integration and predictive capability, as the platform’s utility depends on real-time access to high-quality, interoperable datasets spanning infrastructure, environment, health and mobility.

Fourth, the “planning-to-implementation gap” remains a persistent barrier, particularly in the NBS domain. Many municipalities—even when supported by EU frameworks—struggle to transition from strategic visioning to funded and executable projects. This is exacerbated by a municipal skills deficit in climate adaptation, systems thinking and digital procurement. Without robust capacity-building mechanisms or standardised service models, the adoption of URBREATH’s tools may remain limited to a few high-capacity, frontrunner cities.

Fifth, the economic justification for NBS remains weakly standardised, with few mechanisms to create investment-grade, “bankable” projects. While URBREATH’s modelling capabilities offer a path to financial viability, the current market lacks consensus tools or metrics to measure the long-term ROI of hybrid green-grey infrastructure. This creates a disincentive for private investment, even as public funds remain limited and highly competitive.

Lastly, the overall competitive pressure from platform integrators like Siemens, Dassault and Bentley Systems must not be underestimated. These incumbents are racing to build dominant “urban operating systems” and benefit from massive brand recognition, scale economies and established procurement relationships. Although URBREATH differentiates through openness, co-creation and climate emphasis,

it may face commercial marginalisation unless it secures sustained visibility, policy alignment and integration partnerships within these emerging ecosystems.

5.9 Strategic Implications and Recommendations

The convergence of climate imperatives, digital innovation and systemic urban vulnerability marks a decisive inflection point for the European urban transformation landscape. URBREATH is not simply a technological project, it is a paradigm initiative that redefines how cities approach resilience, regeneration and public value creation through hybrid infrastructures. The following strategic implications and recommendations are derived from this positioning, targeting key stakeholders, including technology providers, public authorities, policymakers, investors and replication actors.

1. URBREATH as a Market Shaper, not a Market Follower

URBREATH's integrated approach and alignment with the EU Climate-Neutral Cities Mission mean it should position itself not as a niche solution, but as a template for the future European urban operating system. The project already serves as a policy-aligned blueprint, featuring Living Labs, Digital Twins and co-designed interventions. Its technology stack should therefore be promoted as a reference architecture, with URBREATH outputs (e.g. urban planning platform, impact assessment modules, multi-scalar resilience metrics) being integrated into future EU procurement guidelines, standards and city-level digitalisation agendas.

2. Converting Barriers into Services: Monetise the Complexity

The primary market barriers identified—regulatory friction (AI Act, GDPR), governance fragmentation, and skills gaps—are not insurmountable liabilities; they are addressable through strategically designed services. URBREATH's technological and governance innovations should be reframed not only as “tools”, but as service layers:

- Compliance-as-a-Service: Embed automated AI governance, transparency logging and GDPR safeguards directly into platform modules.
- Data Governance-as-a-Service: Offer standardised templates for municipal data integration, leveraging URBREATH's knowledge from Living Labs and pilot governance models.
- Planning-as-a-Service: Abstract technical complexity into a RaaS subscription model that delivers outputs (impact scenarios, bankable NBS plans, policy simulations) rather than technical inputs.

3. Bridge the Finance Gap by Reframing URBREATH as a Project Origination Engine

The inability to scale NBS and hybrid infrastructure is no longer due to lack of ideas, but lack of bankable assets. URBREATH has a unique opportunity to act as a financial origination engine, utilising AI-enhanced UDTs to quantify the ROI of resilience measures and produce investment-grade project dossiers.

4. Exploit the European Market Fragmentation Through Open Ecosystem Strategy

Europe's market fragmentation, often seen as a weakness, is in fact an opportunity for an open innovation platform to thrive. Unlike closed systems (e.g. Siemens' vertically integrated stack), URBREATH can emerge as the "integrator of trust", an enabler of interoperability, co-creation and equitable governance.

5. Strengthen the Policy Interface for Post-Project Replication and Upscaling

URBREATH's success will ultimately be measured by its degree of mainstreaming into EU urban policy frameworks. To ensure long-term impact beyond the project lifecycle, the outputs must be codified into replicable formats that inform city and regional climate planning, procurement guidelines and funding instruments.

6. Position URBREATH as an Ethical and Inclusive Standard-Bearer

The deployment of AI and digital twins in urban governance raises ethical questions around transparency, participation and data sovereignty. URBREATH, with its emphasis on participatory co-design and localised governance, has the legitimacy to shape a European ethical standard in digital resilience planning.

In summary, the strategic opportunity for urban resilience technologies is not only open, but EU missions, market demand and climate urgency are actively expanding it. URBREATH is fundamentally aligned with these developments and technologically prepared to lead the way. Nonetheless, achieving widespread adoption and market penetration will require rephrasing the project from solely a demonstrator to a service and system platform that is integrated into the financial, regulatory and operational frameworks of future European cities. The shift from project to product, and from innovation to institution, must commence immediately.

6 Stakeholder engagement plan

Stakeholder engagement is a fundamental pillar of the URBREATH project, ensuring that the technical innovations, social transformations and NBS are co-created, tested, validated, and ultimately adopted by those most affected — the local communities, city authorities, public institutions and urban ecosystem actors. This section outlines the overall approach to stakeholder engagement throughout the project's lifespan, aligning with the objectives of WP8 and reinforcing the project's commitment to inclusivity, participation and systemic transformation.

The engagement strategy of URBREATH is not an isolated communication activity; it is embedded across the project's logic and delivery. It plays a critical role in co-designing and deploying technical solutions, validating evidence-based methodologies and ensuring long-term uptake of project results. In this context, stakeholder engagement supports the broader exploitation and business strategy, acting as a conduit for feedback, community ownership, replication and post-project legacy.

URBREATH operates through a multi-actor and multilevel engagement model, targeting stakeholders across all governance levels (EU, national, regional, municipal) and sectors (public, private, academic, civil society). Particular attention is paid to involving vulnerable or marginalised urban communities, ensuring that solutions are equitable, inclusive and socially just. This is achieved through hybrid tools, such as Local Digital Twins, stakeholder workshops, open consultation processes and urban living labs, tailored to the specific needs and contexts of the four Front Runner Cities and five Follower Cities involved.

Ultimately, this plan ensures that engagement is not a one-off activity, but a continuous, adaptive and integrated process that enables systemic change, validates KERs and supports the project's upscaling and market readiness pathways.

6.1 Objectives of Stakeholder Engagement

The stakeholder engagement strategy in URBREATH is designed to fulfil a set of interlinked strategic objectives that reflect the project's vision for systemic urban transformation, climate neutrality and citizen-driven innovation. These objectives ensure that stakeholder interaction is not superficial or tokenistic but instead contributes meaningfully to the co-creation, deployment and adoption of project outcomes, particularly its technical solutions, methodological frameworks, and NBS.

1. Foster Co-Creation and Social Innovation. One of the core objectives is to facilitate deep engagement with end-users and local actors to co-create hybrid NBS and digital tools tailored to local urban realities. Through iterative feedback loops and participatory methodologies (e.g. urban living labs, policy labs, LDT visualisations), stakeholders become active co-designers rather than passive recipients of innovation.

2. Enable Inclusive Decision-Making and Social Equity. URBREATH prioritises the engagement of underrepresented groups, vulnerable populations and marginalised communities in decision-making processes. The aim is to enhance urban equity and social resilience, ensuring that the project's solutions contribute to fairer, more liveable cities.

3. Enhance Relevance and Local Fit of Technical Solutions. By involving local authorities, practitioners and technical agencies early in the process, stakeholder engagement ensures that URBREATH's outputs, such as Local Digital Twins, AI-based analytics and impact monitoring tools, are relevant, usable and scalable in different urban and climatic contexts.

4. Support Exploitation, Market Readiness and Uptake. Engagement activities are structured to create pathways for exploitation by identifying early adopters, validation partners and feedback providers. This enables the consortium to align Exploitable Results with real-world needs, adapt technical features and foster stakeholder ownership around key results, thereby supporting market readiness and future investment.

5. Facilitate Replication and Policy Impact. Stakeholder interaction is central to the project's transition and replication phase, where insights from the Front Runner Cities will be transferred to the Follower Cities. Engagement also ensures the alignment of URBREATH outcomes with urban planning agendas and policy frameworks, enabling a systemic impact that extends beyond the project's duration.

6. Strengthen Community Awareness and Behavioural Change. In parallel, the engagement plan serves to build awareness and capacity among citizens and civil society actors, fostering behavioural shifts that support long-term climate neutrality and NBS adoption. This includes targeted communication campaigns, participatory monitoring, and citizen science activities.

Together, these objectives form the foundation of a robust stakeholder engagement strategy that enhances the scientific, social and commercial value of the URBREATH project, contributing to its legacy across European urban contexts.

6.2 Stakeholder Typologies and Mapping

Effective stakeholder engagement in URBREATH requires a clear understanding of who the stakeholders are, their roles, and how they relate to the project's objectives, activities and outcomes. This section presents the stakeholder typology and the methodology for identifying and mapping stakeholders across the project's pilot and replication cities, as well as its research, policy and market domains.

6.2.1 Stakeholder Categories

Stakeholders in URBREATH are grouped into six primary categories, based on their institutional roles, interests and potential contribution to or impact from the project:

1. **Public Authorities:** Local, regional and national governments, municipal departments (e.g. urban planning, climate, environment), and regulatory bodies involved in policy development, urban transformation or public procurement.
2. **Scientific and Research Communities:** Universities, research institutes and technical organisations (RTOs) working on climate modelling, environmental analytics, digital twins, social sciences or NBS methodologies. These actors contribute scientific validation, methodological development and technical expertise.

3. **Urban Practitioners and Planners:** Professionals and organisations involved in urban planning, architecture, engineering and environmental design. Their involvement ensures practical relevance and implementation of the proposed NBS and digital tools.
4. **Private Sector and Industry:** Companies developing or adopting smart city solutions, green technologies or data platforms (e.g. SMEs, startups, IT providers, utility companies). Their feedback helps align ERs with commercial and market needs, supporting future exploitation pathways.
5. **Civil Society and Community Organisations:** NGOs, local associations, neighbourhood groups, environmental activists and grassroots initiatives. These stakeholders act as local multipliers, contributing to social innovation and anchoring solutions in lived urban realities.
6. **Citizens and End-Users:** Individuals and local residents, including specific target groups (e.g. youth, elderly, migrants or vulnerable populations), who are affected by or can benefit from the urban interventions. Their active participation is essential for behavioural change, legitimacy and uptake.

6.2.2 Stakeholder Mapping Methodology

The mapping of stakeholders in URBREATH follows a structured methodology that balances representativeness, diversity and alignment with project goals:

- **Interest–Influence Matrix:** Each stakeholder is positioned according to their level of interest in URBREATH’s outcomes and their capacity to influence implementation, policy or uptake. This helps prioritise engagement strategies (e.g. inform, consult, involve, collaborate, empower).
- **Engagement Level Classification:** Stakeholders are classified based on the appropriate level of participation:
 - **Inform** – one-way communication (newsletters, press releases)
 - **Consult** – targeted feedback mechanisms (surveys, interviews)
 - **Involve** – participatory planning (co-design workshops)
 - **Collaborate** – co-implementation and testing (Living Labs, pilots)
 - **Empower** – transfer of ownership and decision-making (citizen-led actions)
- **Local vs. Transnational Mapping:** Stakeholders are mapped both at local level (per city) and across the transnational ecosystem (EU-level networks, urban alliances, replication platforms). This dual scale enables both place-based impact and policy-level scaling.

6.2.3 Preliminary Stakeholder Mapping (per City and Work Package)

Each Front Runner and Follower City has conducted, or will conduct, an initial stakeholder mapping exercise, aligned with their local context and specific activities in WP2, WP5, WP6 and WP8. For example:

- **Cluj-Napoca** focuses on community-led green infrastructure, involving citizens, schools and urban gardeners.
- **Leuven** mobilises university-city partnerships and ecosystem-based planning offices.

- **Madrid** brings together technical agencies and social cohesion actors in vulnerable neighbourhoods.
- **Tallinn** connects digital innovation companies with smart governance and planning units.

This localised mapping ensures that engagement is tailored, inclusive and relevant to each urban and climatic context.

6.3 Engagement Methodology and Tools

The URBREATH engagement approach combines structured participatory processes, place-based interventions and digital innovation to ensure inclusive, adaptive and sustained stakeholder involvement. The methodology is integrated across all phases of the project and aligns closely with co-creation, dissemination and exploitation strategies.

6.3.1 Co-Creation and Living Labs

At the core of URBREATH's engagement model lies the use of Urban Living Labs, experimental environments where stakeholders can collaboratively develop, test and refine NBS and associated digital tools. Each Front Runner City hosts a Living Lab that integrates stakeholder engagement into three layers:

- **Co-design of Interventions:** Stakeholders contribute to scenario-building, planning and prioritisation of urban greening and re-naturing actions.
- **Joint Validation of Tools:** Digital applications (e.g. decision-making platforms, KPIs, LDTs) are tested in real-life settings, with stakeholders providing iterative feedback.
- **Governance and Social Learning:** Cities use the labs to build trust, transfer knowledge and promote long-term institutional adoption.

The co-creation process is structured around the URBREATH Participatory Framework (WP2 and WP4), which combines structured workshops, scenario-based planning, visioning exercises and policy dialogues.

6.3.2 Digital Engagement Tools

URBREATH deploys a comprehensive suite of digital tools to support both online and hybrid engagement, ensuring accessibility, scalability and continuous interaction with stakeholders.

These include:

- **e-Participation Platform (WP4, T4.2):** A modular, open-source digital environment that enables citizens and stakeholders to comment, discuss and vote on local issues and proposed NBS. It includes mapping tools, participatory dashboards and mobile access (iOS/Android).
- **Local Digital Twins (LDTs):** Interactive 3D models of urban spaces that allow users to visualise NBS scenarios and simulate their environmental and social impact. Stakeholders can propose or adjust interventions and compare KPIs before and after implementation.

- **Mobile and Augmented Reality (AR) Tools:** For visualisation and feedback collection in public spaces. These tools support user-friendly, location-based participation (e.g. surveys or tagging features integrated into urban walks).
- **Surveys and Polling Applications:** Embedded in communication campaigns and data collection processes to evaluate preferences, track perception shifts and assess needs across demographic groups.

6.3.3 Face-to-Face and Hybrid Methods

Physical engagement remains essential for building trust and fostering a sense of community ownership. URBREATH therefore integrates:

- On-site workshops and co-design sessions with community groups, planners and experts.
- Policy Labs and city-to-city learning exchanges, supporting mutual learning and governance alignment.
- Pop-up urban interventions (e.g. temporary greening, participatory installations) that attract attention and facilitate informal engagement.
- Targeted stakeholder roundtables (e.g. business forums, public agency consultations) for ER validation and market alignment.

These methods are adapted to local contexts and institutional cultures and are scheduled to coincide with major project milestones (e.g. deployment of NBS, validation of tools, replication phase).

6.3.4 Integration with Communication and Exploitation

Engagement activities are not isolated from dissemination and exploitation but work synergistically with WP8:

- Stakeholder engagement feeds directly into the validation of ERs.
- Engagement outputs inform business planning, standardisation and policy packaging.
- High-engagement events (e.g. Follower City Replication Workshops, WP7) are also key nodes in the project's exploitation and scaling roadmap.

6.4 Engagement Timeline and Phases

Stakeholder engagement in URBREATH is structured across three main temporal phases, each aligned with the project's broader lifecycle: *Inception & Development*, *Piloting*, and *Transition & Replication*. Engagement activities are adapted to the evolving objectives of each phase, ensuring continuity, progressive deepening of involvement, and alignment with project results and exploitation pathways.

6.4.1 Phase I: Awareness and Mobilisation (Months 1–12)

This initial phase focuses on activating the stakeholder ecosystem in each city and at the transnational level. It involves awareness-raising, early involvement and expectation alignment.

Key actions:

- Mapping and categorisation of stakeholders (see Section 6.3)
- Establishment of local stakeholder groups (per FRC and FLC)
- Initial co-creation workshops to define local visions and challenges
- Launch of communication materials (D8.1), websites and digital platforms
- Demonstration of early prototypes (e.g. digital twin mock-ups, KPI dashboards)
- Capacity building for engagement facilitators

Objectives: Build trust, define roles, generate interest in co-creation activities and prepare stakeholders for active participation in decision-making processes.

6.4.2 Phase II: Co-Creation and Implementation (Months 13–39)

This is the **core engagement phase**, where stakeholders actively contribute to the development, validation and deployment of URBREATH tools and NBS interventions.

Key actions:

- Participatory planning and co-design of urban greening interventions (via Living Labs)
- Regular stakeholder meetings and feedback loops for tool refinement (WP3, WP4)
- Testing and validation of the decision-support system, LDTs, AI components and monitoring tools
- Co-creation of an instrument of the impact to finance framework in FRC and FLC (WP7)
- Deployment of e-participation platforms and mobile tools to broaden inclusivity
- Stakeholder-driven pilot implementation of hybrid NBS in the four FRCs
- Engagement with Follower Cities through transnational learning events

Objectives: Deepen participation, validate ERs, enhance local ownership and demonstrate real-world applicability and societal value.

6.4.3 Phase III: Transition, Replication and Legacy (Months 40–48 and beyond)

The final phase focuses on sustaining impact and transferring knowledge to new settings. Stakeholders play a central role in disseminating practices, refining business models and scaling up innovations.

Key actions:

- Final policy dialogues and clustering events to embed URBREATH solutions into governance and urban policy frameworks
- Replication workshops between FRCs and FLCs (WP7)
- Stakeholder contributions to local roadmaps (e.g. D7.9, D7.10)
- Evaluation of engagement outcomes and satisfaction (via surveys and interviews)
- Development of long-term engagement strategies and legacy actions beyond the project
- Strategic alignment with EU missions Climate-Neutral Cities and Smart Communities

Objectives: Anchor project results in institutional practices, support market readiness and standardisation and build pathways for replication across EU cities.

6.5 Governance and Roles

The governance of stakeholder engagement in URBREATH is designed to ensure coherence, accountability and responsiveness across all engagement activities, from local co-creation to transnational policy influence. Stakeholder engagement is not managed by a single partner, but distributed across thematic, technical and territorial responsibilities in alignment with the project's work package structure.

6.5.1 Coordination at Project Level

At the strategic level, overall coordination of engagement is embedded within Work Package 8 (WP8 – Impact Creation and Exploitation), led by ATC. WP8 ensures alignment between engagement, communication, dissemination, exploitation and standardisation activities, offering a central structure for integration across the project.

- **ATC (WP8 Lead):** Oversees stakeholder engagement strategy, ensures methodological coherence and monitors engagement KPIs. Provides communication tools and reporting templates used across all cities.
- **DBC:** Leads the development and implementation of the Exploitation Plan (D8.4–D8.7), which is directly informed by stakeholder feedback, ER validation and interest alignment.
- **LC (Project Coordinator):** Supports strategic stakeholder engagement related to policy impact, project visibility and replication alignment (e.g. through clustering events and European missions).
- **POLIMI and URB:** Provide methodological leadership for co-creation frameworks and Living Labs (WP2), ensuring that stakeholder engagement is grounded in participatory design and transdisciplinary approaches.

6.5.2 City-Level Implementation and Facilitation

Each of the four FRCs is responsible for local implementation of engagement activities, supported by their respective city departments and technical partners:

- Cluj-Napoca, Leuven, Madrid and Tallinn facilitate local stakeholder mapping, establish Local Stakeholder Groups and coordinate Living Lab activities.
- Local engagement is adapted to each city's governance structure, cultural context and climatic zone.
- City partners are supported by thematic partners (e.g. VLO, MUN, FIC) who bring technical expertise on NBS, data and socio-economic modelling to local discussions.

The FLCs — Aarhus, Athens, Kajaani, Parma, and Pilsen — progressively intensify their engagement activities during the Transition Phase, facilitated through replication-oriented learning events (WP7).

6.5.3 Engagement in Technical WPs

Beyond WP8, stakeholder engagement is embedded in several core technical WPs:

- **WP2 (Systemic Approach and Co-Creation):** Designs participatory frameworks and adaptive pathways for NBS deployment.
- **WP3 (Data and AI Tools):** Engages stakeholders in the design and validation of AI models, environmental forecasts and socio-economic simulations.
- **WP4 (Decision-Making Framework):** Ensures usability of LDTs, e-participation tools and KPI catalogues through direct stakeholder involvement.
- **WP5 (Living Labs):** Operationalises engagement at local level via co-design and piloting.
- **WP7 (Scaling and Replication):** Leverages stakeholder input to shape investment plans, standardisation and institutional adoption.

6.5.4 Role of Networks and External Stakeholders

URBREATH also mobilises transnational networks to expand engagement beyond the core consortium:

- BLOXHUB, OASC and CA play key roles in connecting local actors to international platforms and policy dialogues.
- Stakeholders from external initiatives (e.g. NetZeroCities, Living-in.EU) are engaged to ensure synergies, avoid duplication and maximise impact.

This distributed governance structure allows URBREATH to maintain high levels of engagement quality and consistency while adapting to diverse urban contexts and stakeholder realities.

6.6 Engagement Activities and Mechanisms

URBREATH deploys a comprehensive and multi-layered set of activities and mechanisms to operationalise stakeholder engagement throughout the project. These activities are tailored to support co-creation, validation, communication, exploitation and replication, and are implemented both locally (within each Front Runner and Follower City) and at the transnational level through clustering, policy dialogue and knowledge transfer initiatives.

6.6.1 Local Stakeholder Group Activities

Each Front Runner City has established a local stakeholder group composed of public authorities, local businesses, research institutions, civil society actors and citizens. These groups are the primary vehicles for local engagement. Typical activities include:

- Regular multi-stakeholder meetings (quarterly or milestone-based)
- Visioning sessions and participatory planning workshops
- Co-design of hybrid NBS and urban regeneration pathways
- Feedback sessions on tools such as the Digital Twin, KPI Catalogue and AI models
- Site visits and demonstrations of pilot actions

These activities ensure that stakeholders are actively involved in shaping both the technical and strategic directions of the project, with special attention to local needs and governance cultures.

6.6.2 Participatory Digital Tools and Online Mechanisms

A wide array of digital engagement tools complements physical meetings, ensuring accessibility and continuity. These tools are especially relevant for broader stakeholder groups and remote participants.

Key mechanisms include:

- Use of the URBREATH e-participation platform to collect proposals, comments and votes on interventions
- Mobile engagement apps with geotagged feedback features
- Online surveys for stakeholder profiling, satisfaction and ER validation
- Dashboards that visualise impacts and allow comparison of intervention scenarios

The tools are deployed in waves, with increasing functionality over time, in alignment with technical development timelines (WP4).

6.6.3 Urban Living Labs

Living Labs function as structured spaces for experimentation and iterative engagement. They enable hands-on testing of tools, feedback cycles and behavioural change initiatives. Living Lab mechanisms include:

- Scenario-based workshops to explore alternatives and assess trade-offs
- Temporary public installations or pop-up events to visualise NBS
- Interactive demonstrations using Augmented Reality/Virtual Reality and 3D visualisations
- Local campaigns co-designed with citizens to foster awareness and behavioural shift

Living Labs are supported by the participatory frameworks developed in WP2 and evolve across the project phases.

6.6.4 Policy Dialogues and Institutional Engagement

To ensure vertical integration and policy alignment, URBREATH organises targeted stakeholder events involving regional, national and European-level institutions. Examples include:

- Thematic policy dialogues on NBS, digital tools or climate adaptation
- Strategic roundtables with urban planners, public procurement officers and regulators
- Contribution to external clustering events (e.g. NetZeroCities, Mission Platform)
- Standardisation workshops linked to WP7 outcomes

These events not only help validate project results but also position URBREATH within wider urban and policy ecosystems.

6.6.5 Transnational Replication Activities

Engagement activities extend beyond the pilot cities through structured replication efforts involving the five Follower Cities. Key replication mechanisms:

- Replication workshops and peer-to-peer exchanges between FRCs and FLCs
- Tailored capacity-building sessions and “learning by doing” methodologies
- Development of Urban Green Investment Plans and Local Roadmaps
- Use of lessons from FRC engagement to tailor FLC approaches and tools

This ensures that knowledge is transferred not just vertically (within cities) but also horizontally across the European urban network.

6.7 Monitoring, Evaluation and Feedback

A critical component of URBREATH’s stakeholder engagement strategy is the systematic monitoring and evaluation of engagement processes and outcomes. This ensures that engagement activities are effective, inclusive and aligned with the project’s objectives and that feedback from stakeholders is actively integrated into the development and exploitation of project results.

6.7.1 Monitoring Framework

URBREATH applies a structured framework for tracking and assessing stakeholder engagement across all phases of the project, coordinated under WP8 (Impact Creation and Exploitation). This framework is aligned with the project’s KPIs and Deliverables (notably D8.2, D8.4, and D8.7).

Main monitoring dimensions include:

- **Quantitative Indicators:** number of stakeholders engaged, events held, surveys conducted, platform interactions, demographic diversity of participants.
- **Qualitative Indicators:** stakeholder satisfaction, perceived inclusivity, quality of co-creation, influence on decision-making and integration of feedback.
- **Engagement Typology:** tracking the level of engagement per stakeholder (inform, consult, involve, collaborate, empower) and evolution over time.

Monitoring is carried out at both the local level (by each Front Runner and Follower City) and the project level (by ATC and DBC), using shared templates and digital tools.

6.7.2 Evaluation Mechanisms

The evaluation process includes regular reviews of engagement effectiveness and stakeholder impact on key project components:

- **Post-event evaluations:** All major workshops, labs and dialogues include structured participant feedback forms.
- **Surveys and perception studies:** Periodic surveys measure trust, motivation, satisfaction and perceived ownership among stakeholders.

- **Analytical dashboards:** Engagement data from digital tools (e.g. platform usage, comments, AR feedback) are analysed to understand stakeholder behaviours and adapt strategies accordingly. Evaluation findings are reported internally in WP8 and used to adapt upcoming engagement activities, tool features and communication strategies.

6.7.3 Feedback Loops and Adaptive Learning

Stakeholder engagement in URBREATH is designed to be reflexive and iterative. Feedback is not only collected but actively used to improve project outputs and strategies, creating a continuous learning cycle.

Key feedback integration mechanisms include:

- Inclusion of stakeholder comments in the refinement of ERs.
- Adjustment of Digital Twin functionalities based on participatory feedback.
- Revisions to Local Roadmaps based on citizen and institutional input.
- Cross-city learning: Follower Cities are encouraged to provide critical feedback to FRCs as part of replication and validation processes.

This continuous loop enhances the responsiveness, legitimacy and impact of project activities, while also building stakeholder trust and long-term engagement.

6.8 Risks and Mitigation Measures

While stakeholder engagement is essential to the success of URBREATH, it also presents a range of potential risks that must be proactively managed. These risks can arise from participation fatigue, mismatched expectations, limited inclusivity or resistance to innovation. This section outlines key risks identified across the project lifecycle and presents the corresponding mitigation strategies to ensure robust and inclusive engagement.

6.8.1 Key Engagement Risks

1. **Low Participation or Stakeholder Fatigue:** Repeated consultations or engagement activities, especially in complex projects, can lead to decreased motivation and loss of interest, particularly among citizens or small organisations.
2. **Uneven Representation and Lack of Inclusivity:** Engagement processes may disproportionately involve institutional actors or those already familiar with urban governance, leading to underrepresentation of vulnerable groups or civil society.
3. **Stakeholder Resistance to Change:** Some actors, especially public authorities or businesses, may be sceptical of co-creation processes or cautious about adopting new tools (e.g. LDTs, AI-based systems).
4. **Conflicting Interests Among Stakeholders:** Diverging priorities — e.g. between real estate developers, environmental NGOs and residents — may create tensions that hinder consensus or slow down implementation.

5. **Lack of Integration with Technical Workflows:** If engagement outputs are not properly channelled into tool development, business modelling or pilot design, stakeholders may feel their input is ignored, reducing trust and legitimacy.
6. **Language, Cultural and Digital Barriers:** Particularly in multinational projects, differences in language, culture and digital literacy can hinder engagement, particularly in Follower Cities or among vulnerable populations.

6.8.2 Mitigation Measures

To address these risks, URBREATH implements a set of proactive measures embedded into its engagement governance and methodology:

- Stakeholder mapping and profiling ensures diversity and intentional inclusion of underrepresented voices from the outset (see Section 6.3).
- Adaptive engagement design, including hybrid events and asynchronous online tools, allows flexibility in participation modes and scheduling.
- Use of trusted intermediaries, such as local NGOs or community facilitators, helps build trust and reach marginalised groups.
- Clear communication of objectives and benefits, especially early in the project, helps manage expectations and highlight value for participants.
- Integration of engagement results into project deliverables, especially ERs and Local Roadmaps, ensures visibility and impact of stakeholder input.
- Conflict mediation techniques, such as structured deliberation and consensus-building exercises, are used in Living Labs and policy dialogues.
- Monitoring of inclusivity indicators (gender, age, socioeconomic status, etc.) ensures ongoing assessment and adjustment to maximise reach and equity.

By anticipating and addressing these risks, URBREATH aims to sustain engagement quality, deepen stakeholder ownership and ensure that its participatory processes are meaningful, fair and impactful.

6.9 Conclusions and Contribution to Exploitation and Replication

Stakeholder engagement in URBREATH is a core mechanism through which the project achieves impact, legitimacy and long-term sustainability. By embedding engagement across technical, policy and community dimensions, URBREATH creates the conditions for truly systemic urban transformation, aligned with climate neutrality, social inclusion and innovation goals.

Throughout the project lifecycle, stakeholders are not treated as passive recipients but as active co-creators, validators and adopters of the project's KERs. This participatory approach ensures that tools such as Local Digital Twins, AI-driven planning models and hybrid NBS are relevant, usable and scalable across diverse urban contexts.

The engagement strategy also contributes directly to the project's exploitation framework in three critical ways:

- **Validation of Market Potential:** Through structured feedback loops and iterative testing, stakeholders help assess the applicability, usability and demand for specific ERs, directly informing the Business Model Canvas, Value Propositions and Exploitation Routes developed in D8.4 and D8.5.
- **Institutional Uptake and Policy Alignment:** Engagement with public authorities and planning institutions fosters integration of URBREATH tools and methodologies into existing governance systems. This supports regulatory alignment and opens pathways for public procurement and policy-driven scale-up.
- **Replication and Post-Project Continuity:** Stakeholder mobilisation in the Follower Cities, together with clustering and knowledge transfer mechanisms, ensures that URBREATH outcomes can be replicated beyond the pilot sites. Local Roadmaps, and the co-created URBREATH Replication Guidelines (D7.10) and impact to finance framework (D7.8) will build on stakeholder insights to guide long-term adoption.

Furthermore, engagement contributes to the legacy dimension of the project, with at least four permanent URBREATH centres planned across the Front Runner Cities, serving as anchors for ongoing co-creation, awareness-raising and the dissemination of innovation.

7 Conclusions

The deliverable consolidates the intermediate state of URBREATH’s exploitation, business planning and commercialisation activities, providing a stable reference point for the final phase of Work Package 8. It combines the definition and assessment of Exploitable Results, the identification of Key Exploitable Results, the individual and joint exploitation plans of 37 partners, and a comprehensive business and sustainability model supported by updated market and stakeholder intelligence.

First, the work on ERs and KERs has resulted in a clearly defined and prioritised portfolio of results that reflects the systemic nature of URBREATH. The project has transitioned from a broad inventory of 26 ERs to a focused set of KERs through a structured, partner-driven assessment process, based on harmonised scoring of innovation, exploitability and impact. This approach has ensured transparency, comparability and strategic alignment with Horizon Europe expectations, providing a robust evidence base for targeting resources on those results with the most significant potential for downstream exploitation.

Second, the collection and analysis of individual and joint exploitation plans show that exploitation within URBREATH is not just an abstract task but a tangible and varied set of commitments. Academic and research partners intend to incorporate methodologies, frameworks and models into their teaching, doctoral research and future projects, ensuring scientific continuity and further knowledge creation. Technology-focused partners are developing commercial offerings around digital twins, e-participation tools, AI-based analytics and geospatial monitoring platforms, using business models that include SaaS, APIs, licensing and integration into existing product suites. Meanwhile, cities and public authorities are integrating URBREATH outputs into their climate neutrality roadmaps, participatory governance systems and innovation ecosystems, indicating a strong potential for institutionalisation and policy-level influence.

Third, the analytical summary of these exploitation plans reveals several cross-cutting patterns that are critical for the overall business and sustainability model. There is clear added value in joint exploitation: partners are forming alliances around tool co-development, shared infrastructures, mission-oriented replication channels and knowledge platforms, rather than pursuing isolated trajectories. Civil society and consultancy actors emphasise the social and behavioural dimensions of URBREATH, using co-creation, capacity building and policy support as vehicles for societal impact. The timing of exploitation activities is also coherent, with most partners planning post-project uptake in the 2028 window and many KERs expected to reach TRL 6–7 or beyond by project end, which reinforces the feasibility of the proposed routes.

Fourth, the stable version of the Business Plan and Sustainability Model confirms that URBREATH’s added value lies in a modular ecosystem rather than a single monolithic product. The project’s combined offering – spanning digital twins, AI-driven impact modelling, participatory co-creation methodologies and environmental monitoring suites – is shown to align with an emerging “urban resilience” market in which integrated Resilience-as-a-Service platforms are expected to dominate. The business plan identifies a diversified mix of exploitation models, including commercial services, consultancy, open-access components, public procurement integration and replication support, tailored to the nature of each KER and the profile of the exploiting partners. It also sets out initial

governance and stewardship arrangements, licensing approaches and maintenance responsibilities that will underpin long-term sustainability beyond the funded period.

Fifth, the updated market and competition analysis confirms that URBREATH is well-positioned within a rapidly evolving European and global landscape for urban transformation. The analysis highlights the convergence of NBS, urban digital twins, high-resolution environmental modelling and AI analytics into a single “urban resilience” sector, emphasising that the main bottlenecks are increasingly institutional and regulatory rather than technological. In this context, URBREATH’s integration of advanced digital tools with governance and participation frameworks addresses the identified market gap: cities require solutions that not only generate data and simulations but also assist them in navigating regulatory requirements, bridging data silos and closing capacity gaps in climate adaptation and data-driven planning.

Sixth, the deliverable demonstrates that exploitation is closely connected with stakeholder engagement, pilot activities and replication mechanisms. Front Runner and Follower Cities are not only testbeds but also early adopters and co-designers of URBREATH outputs, forming a living ecosystem of practice around the tools and methodologies developed in the project. Replication pathways via Mission Cities, thematic networks, labs and EU-level platforms are already being activated, offering credible channels for scaling and cross-context transfer. This shows that exploitation is integrated into the project’s broader governance and community structure rather than being a separate work stream. Finally, the Business Plan and the analytical sections of this deliverable collectively demonstrate that the main risks to exploitation – including technological integration challenges, stakeholder fragmentation and uncertainties in post-project funding – are recognised and addressed. Mitigation measures are embedded in the design of joint exploitation arrangements, in the emphasis on open and interoperable architectures, and in the alignment with major EU policy frameworks and funding initiatives. D8.5 therefore concludes that URBREATH has established a coherent, partner-owned and market-aware basis for exploitation, while also clearly identifying the remaining work. The next phase, to be detailed in D8.6 and D8.7, will focus on refining and operationalising the most promising business cases, updating and deepening partner exploitation plans, validating financial and organisational assumptions, and consolidating governance and sustainability arrangements so that URBREATH’s results can serve as enduring tools for urban transformation well beyond the lifetime of the project.

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