Interreg CENTRAL EUROPE

Co-funded by the European Union

MISSION CE CLIMATE

D.2.2.1. Five climate resilience pilot projects implemented

Pilot Project Completion Report

Document type: Final version

Period 6

Contents

1. Introduction

This document represents the Deliverable 2.2.1: and provide the evidence and description of implemented pilot projects in geographic areas of Commune Lignano Sabbiadoro (IT), City of Dornbirn (AT), City of Košice (SK), City of Pforzheim (DE), City of Maribor (SI), Splitsko-Dalmatinska County (HR) with thematic focus on:

Pilot project thematic focus	Pilot project geographic area
Governance of climate change in community through cross-sectoral, coordinated and participatory approach	Commune Lignano Sabbiadoro (IT)
Data acquisition, monitoring, analysis and interpretation using digital solutions	City of Dornbirn (AT)
Data acquisition, monitoring, analysis and interpretation using digital solutions	City of Košice (SK)
Citizen science and participation for monitoring and adapting to climate change	City of Pforzheim (DE)
Combating urban heat islands using innovative methods	City of Maribor (SI)
Combating water scarcity in coastal areas	Splitsko-Dalmatinska County (HR)

2. Contribution to climate resilience

All pilot projects contributed to enhancement of climate resilience of communities in specific thematic fields:

Thematic field 1: Data acquisition, monitoring, analysis and interpretation using digital solutions

The Dornbirn pilot advances climate adaptation by proving a practical, city-ready pipeline for data acquisition, monitoring, analysis, and interpretation of urban heat. Using the heat index to compute perceived temperature, it translates raw sensor data into human-centric risk signals for planners and the public. These insights are then shared via the CityMonitor dashboard, which turns technical readings into clear visuals that support awareness, policymaking, and replication across new sites. In sum, the pilot operationalizes an end-to-end digital method—from robust sensing to meaningful public interpretation—that municipalities can reuse to target, validate, and prioritize nature-based cooling measures.

The Košice school-based climate resilience pilot provides a controlled, real-world testbed for the full digital data lifecycle—from sensor readings to public interpretation. Multi-parameter sensors installed on school grounds capture local air and weather conditions and transmit them to the city's Open Data platform. On top of this pipeline, a public "Climate data monitoring" dashboard transform raw streams into intelligible insights, linking values to health and environmental impacts and recommended behaviors. Thanks to cooperation with school teachers, human-centered interpretation of data was ensured and the solution was incorporated into the curriculum through prepared lesson plans and student projects, thereby promoting its lasting acceptance.

Both pilots share a common architecture and purpose: they operationalize an end-to-end digital pipeline—from on-the-ground sensing through monitoring, analysis, and public interpretation—to turn climate data into decisions. Each deploys physical sensors to capture local microclimate conditions and then translates raw readings into human-centric signals that non-experts can understand (e.g., perceived heat, health relevance, recommended behaviors). Results are published via public dashboards that convert technical measurements into clear visuals, strengthening awareness and enabling evidence-based policymaking. The solutions are aligned with municipal, designed for replication across new sites, and explicitly support planners in targeting and prioritizing adaptation measures. Hereby, both initiatives demonstrate how robust data acquisition and analytics, combined with accessible communication, can drive practical, scalable climate resilience.

Thematic field 2: Governance of climate change in community through cross-sectoral, coordinated and participatory approach

The Lignano Sabbiadoro pilot contributes to climate-challenge solutions in community climate governance by proving a cross-sectoral, coordinated, and participatory model that turns strategy into accepted action. It mobilized the municipality and wide range of other stakeholder groups to co-design interventions and produced a City-Council-approved masterplan for a flood-vulnerable area, building social license for implementation. It advanced citywide rules via a Green Management Plan and launched a participatory path to its regulatory framework so responsibilities and standards are co-defined with citizens, aligning daily practice with resilience goals. To mainstream awareness and coordination across disciplines, the Lignano 180° festival connecting technical planning, nature-based approaches, mobility, and public-space quality with civic dialogue—positioning governance as both technical and cultural work.

Thematic field 3: Citizen science and participation for monitoring and adapting to climate change

The pilot in Pfozheim contributes a practical, scalable pathway for tackling climate challenges by turning citizen participation into continuous environmental intelligence and actionable local decisions. It delivers a low-cost LoRaWAN sensing network, using The Things Network and an enerchart dashboard, that citizens and students help install and operate, shifting monitoring from occasional expert surveys to always-on, community data streams. The project couples technology with a DIY Citizen Toolkit and campaigns that grow digital literacy and ownership. By blending open IoT, user-centric dashboards, and structured citizen science, the pilot accelerates how communities monitor and adapt to climate change while building the social capital needed for long-term resilience.

Thematic field 4: Combating urban heat islands using innovative methods

The Maribor pilot contributes to combating urban heat islands by pairing nature-based solutions at bus stops—living roofs and added planters—with continuous IoT monitoring and open data. Focusing on transit shelters tackles heat where people actually spend time, delivering immediate shade, evapotranspiration cooling, and small biodiversity gains that make waiting more comfortable. Sensors at treated and reference stops will stream temperature, humidity, particulates, key gases, rainfall, solar radiation, and wind into the municipal platform, turning each micro-intervention into evidence for before/after evaluation and transparent replication. The pilot offers a practical, policy-aligned, and data-validated pathway cities can reuse to cool hot spots quickly and scale what works.

Thematic field 5: Combating water scarcity in coastal areas

The Brač pilot contributes a practical, scalable solution set for combating water scarcity in coastal areas by turning non-revenue water into a resilience resource. It replaces aging meters with magnetic-inductive units and expands telemetry and leak-detection capability to continuously find and fix losses, cutting distribution losses and stabilizing supply during droughts and peak tourist seasons. The project couples technology with governance—creating a dedicated Water Loss Unit, integrating data into simple operator dashboards, and validating savings over a full seasonal cycle—so utilities can act on evidence, not estimates. Night-time works and staged procurement show how to modernize coastal networks with minimal service disruption and within tight budgets, while citizen guidance materials reduce household demand. The result is a replicable “coastal playbook”: instrument priority reservoirs and trunk lines, isolate sectors to pinpoint leaks, align interventions with tourism cycles, and use split-financing to de-risk delivery. Beyond securing potable water, the approach lowers pumping energy and emissions, strengthens drought preparedness, and offers a ready-to-adopt toolkit and operating model for other island and shoreline utilities facing climate-driven water stress.

3. Pilot Project profiles

This section describes realization of all 6 pilot projects within the WP2: Catalysing Climate Resilience of Communities through Pilot Projects in 5 thematic fields: governance od climate change in community, climate data management, citizen science and participation at adaptation, combating urban heat islands and water scarcity in coastal areas.

3.1. Pilot Project in Košice

Main pilot goal

Improve data governance for decision-making and increase the availability of local climate data for the public—especially for education and awareness—by monitoring climate indicators at up to 10 outdoor school sites and visualizing them via an open digital dashboard.

Pilot overview

The pilot's overarching goal is simple and city-pragmatic: improve data governance for decision-making while making local climate data openly available for education and public awareness. It does this through three pillars: (1) monitoring climate indicators at up to 10 outdoor school sites, (2) creating an education program that uses the data in regular lessons, and (3) publishing a friendly public dashboard integrated with Košice's Open Data platform.
This "measure-learn-act" loop aligns directly with the city's Adaptation Plan and supports the Climate City Contract under the EU Mission for Climate-Neutral and Smart Cities—so the work in schoolyards also scaffolds city-level action.
Based on the city's risk and vulnerability analysis, the project team selected school locations in hotter, more exposed parts of Košice. Indicators monitored include particulate matter (PM10), nitrogen dioxide (NO_2), carbon monoxide (CO), air temperature idicators and wind idicators.

TUKE and Košice city stood up an Azure-based pipeline (IoT Central/Hub) that streams readings into the municipal Open Data environment, enabling daily exports and simple widgets for school websites and internal screens. This technical stack underpins the public dashboard where anyone can explore values, impacts on people and the environment, and recommended behaviours.
Cooperation launched with seven elementary schools, each treated as its own community. The Košice city and TUKE convened a co-creation workshops to define how schools want to use data—pedagogically, strategically, for community engagement, and for spatial micro-interventions like shading and greening.

TUKE and teachers co-developed an education program for the 2025/26 school year. Ready-to-use worksheets show how to bring live climate data into Physics, Biology, Chemistry, and Civic Education, building students' digital and analytical skills while keeping lessons tied to real places.

The "Climate data monitoring" dashboard doesn't just plot lines; it explains what the indicators mean, why they matter for health and the environment, and what residents can do. It draws directly from datasets published on Open Data Košice, closing the loop between sensors, city systems, and citizen understanding.

Pilot achievements & highlights

Košice climate pilot ties sensors to lessons, dashboards to open data, and open data to community micro-actions. It's a digitally heavy solution by design (no direct nature-based installations in the pilot), but it deliberately points toward nature-based responses—shade, trees, permeable surfaces—guided by measured conditions at each school.

A city-university-schools system for local climate monitoring and education was moved from concept to operation: seven school-based stations were installed (Jan 2025), data flows into the City's Open Data platform via Azure IoT, a public "Climate data monitoring" dashboard was developed and tested, and a curriculum-linked education program was co-created with teachers for the 2025/26 school year. Customized school dashboards for on-premise displays and a replication toolkit (co-creation agenda, commissioning checklist, communication guidance) were planned to support scale-up and igniting citizens ownership.

Pilot KPI review

Evaluation dimension	Specific KPI	KPI Target value	Reached KPI value	Comments
Usability of solution				
Relevance	Pilot solution design is accepted by regional stakeholders.	4 stakeholders accepted the Pilot design	4	Reference to strategic documents in the pilot status report 01.
Coherence	Pilot solution is aligned with implementation of climate adaptation strategies or policies on local/regional level.	2 strategies	2	Reference to strategic documents in the pilot status report 01.
Sustainability	Long-term sustainability of the pilot digital solution is ensured.	1 solution maintenance document	1	Reference to strategic documents in the pilot status report 03.
Up-scaling of solution				
Integration	Cross-Platform Compatibility - Pilot digital solution is compatible with at least 1 digital platform	1 digital platform compatible with the solution	1	Reference to strategic documents in the pilot status report 03.
Community Awareness building				
Trainings & Dissemination events	Education programme for capacity building of target groups is created	1 education programme	1	Reference to strategic documents in the pilot status report 03.

Lessons learned

Bringing school leaders and teachers in from day one turns the pilot from a “city project at schools” into a “school project for the city.” Early, genuine involvement builds ownership and motivation, improves data use in lessons and school life, and makes the approach easier to transfer to other schools. That ownership translates into motivation—teachers bring data into class discussions, principals champion the project to parents, and students start asking sharper questions. It also improves transferability: once the approach is co-designed, it’s easier to replicate at other schools because the model already reflects real classroom needs and routines.

Air quality and weather stations are only as trustworthy as their placement. Avoiding mutual interference requires thoughtful mounting (clear airflow, distance from walls/vents, stable power/connectivity). Plan for a commissioning check and, if needed, timely replacement of faulty units.

Publishing school-level climate data can unintentionally stigmatize specific schools or neighbourhoods. Emphasize learning and action—what this means for student health today, which simple steps help (e.g., timing outdoor activities, opening windows, planting shade), and how microclimates differ even across short distances.

Dashboards and open data gain real value when embedded in teaching. Education is the sustainability lever that keeps the project alive after the pilot window closes. Lesson plans and student projects build skills and awareness and create a feedback loop where communities understand the data and act on it—an approach that can be replicated elsewhere.

3.2. Pilot Project in Maribor

Main pilot goal

Deploy and test NBS at bus stops to reduce heat-stress exposure, improve micro-climate and citizen well-being, generate open climate datasets, and create a replicable model for other city locations.

Pilot overview

Maribor is testing a simple but powerful idea: make bus stops greener and smarter to cool the city and make everyday life more comfortable. Under the MISSION CE CLIMATE initiative, the municipality and its partners are turning heat-exposed transit shelters into small nature-based solutions (NBS), pairing living roofs and planters with sensors that track micro-climate and air quality. The goal is twofold—ease heat stress for people who spend time at stops and generate open data the city can use to replicate what works.

The pilot's focal point is the Vetrinjska Street bus stop, one of the busiest in the city. Here, the team prepared a conceptual design and costs, secured cultural-heritage consent, aligned with concessionaires, and drew up tender specifications for both the green infrastructure and a suite of IoT sensors. To keep momentum while formal approvals and procurement ran their course, the city also greened several other central shelters. This "learn by doing" step yielded practical lessons, kept the public engaged, and helped de-risk installation at the flagship site.

Bus stops were chosen because they gather many people—kids, commuters, and older adults—often with little shade during peak heat. Green roofs and planters can lower surface and ambient temperatures, add a touch of biodiversity, and make the wait noticeably more pleasant. But the pilot isn't just about aesthetics; it's about evidence. Sensors will measure air temperature and humidity, particulates (PM2.5/PM10), gases such as ozone, carbon monoxide and nitrogen dioxide, rainfall, solar radiation, and wind. By comparing treated and untreated locations, the city will build a clear picture of how much cooling and comfort the interventions deliver under real conditions.

Despite the inevitable administrative choreography, tangible progress is visible. Urban equipment for the pilot site has been delivered, greening at several central shelters is already in place, and installation of the Vetrinjska site's NBS and sensor package is prepared. A pre-installation on-site survey captured the experiences and needs of 200 citizens; a follow-up survey will gauge how perceptions change once the green roofs, planters, and monitoring are operating. The city will publish the resulting datasets openly through its platform, turning a single pilot into a reusable knowledge asset.

Pilot achievements & highlights

Maribor's pilot directly targets heat-exposed micro-sites—bus stops—by combining nature-based solutions (NBS) with digital monitoring, an approach that is both place-specific and scalable. Green roofs and added vegetation at shelters provide shading, evapotranspiration, and biodiversity gains that cool the immediate micro-climate and improve comfort for frequent users, including vulnerable groups.

What makes the method innovative is the tight integration of NBS and IoT. Sensors at treated and untreated stops will stream 11 climate and air-quality datasets (e.g., temperature, humidity, PM2.5/PM10, O_3, CO, NO_2, rainfall, solar radiation, wind) as open data into the city platform. This turns a physical intervention into evidence-driven adaptation, enabling before/after analysis, public transparency, and data-guided replication across additional sites.

The pilot is also systems-aware: it aligns with Maribor's climate strategies, secures heritage and traffic approvals, and coordinates with concessionaires—showing how to deliver NBS in complex urban settings. Where administrative steps caused delays, the team greened alternative shelters to maintain learning and citizen visibility, demonstrating an agile model for incremental roll-out.

In short, the pilot exemplifies the thematic topic by mitigating urban heat islands through innovative, data-validated NBS, embedded in local policy, co-created with stakeholders, and designed for replication city-wide.

Pilot KPI review

Evaluation dimension	Specific KPI	KPI Target value	Reached KPI value	Comments
Usability of solution				
Relevance	• No. of strategic documents identifying the local needs.	3	3	Reference to strategic documents in the pilot status report 01.
Effectiveness	• No. of interventions with NBS solutions. • No. of climate datasets coming from sensors.	2 3	2 11	Reference to No. of interventions with NBS solutions in the Pilot status report 03 (description of Activity 10). Reference to No. of climate datasets coming from sensors in the Pilot status report 03 (description of Activity 12).
Efficiency	• No. of exploited assets (assets already used in another project such as open data portals).	1	1	Reference to No. of exploited assets (assets already used in another project such as open data portals) in the Pilot status report 03 (description of Activity 12).
Impact	• More green infrastructure in public spaces. • Improved well-being of citizens. • Pilot case possible to replicate in other locations in the city with the continued collection of data. • Improved micro-climate on the pilot site (better air quality and lower temperature).	1 (yes) 1 (yes) 1 1 (yes)	1 1 1 1	Reference to KPIs in the Pilot status report 03 (description of Activity 12).
Up-scaling of solution				
Adaptability	• No. of different NBSs to choose from in the process of the pilot definition (*several different greening suggestions make it easier to adapt the solution*).	3	3	Reference to different NBS in the pilot status report 01.
Community Awareness building				
Community Engagement	• No. of people participated in a survey (no. of citizens involved). • No. of stakeholders involved in the planning of the pilot action (solution).	100 10	200 15	No. of people participated in a survey: Reference to No. of people participated in a survey in the pilot status report 03. No. of stakeholders involved in the planning of the pilot action (solution): Reference to No. of stakeholders in the pilot status report 01, 02 and 03.

Lessons learned

The implementation of the Maribor pilot project faced several challenges typical for innovative urban initiatives. Establishing collaboration among diverse stakeholders and acquiring new external knowledge required significant time, making project processes longer than initially planned. The pilot was highly dependent on external experts due to the specific technical and environmental expertise needed, while limited project funding restricted the scope of implementation. Spatial interventions were further constrained by strict regulations and the need for approval from heritage, urban planning, and architectural authorities, which also limited opportunities for citizen involvement in site and design decisions. Integrated urban solutions demanded additional resources and coordination across multiple services. Although transferring good practices from elsewhere was helpful, they were not always suitable for the local context.

Administrative and approval procedures on public sites often caused timeline shifts, emphasizing the need for flexibility in planning. Interim actions, such as greening alternative bus shelters, were valuable for maintaining visibility and stakeholder engagement during delays. Complex and lengthy public procurement processes also affected the overall schedule. Despite these challenges, early partial implementations and continuous communication with stakeholders and the public helped sustain momentum, gather useful feedback, and adapt subsequent project phases effectively.

The work is a true multi-actor effort. The Municipality of Maribor leads, with the Regional Development Agency for Podravje – Maribor as a key partner. Urban planners, utilities and maintenance services, bus stop and street-furniture concessionaires, universities, and specialized suppliers are all part of the mix. That breadth brings strength—and complexity. Coordinating timelines, navigating heritage and traffic rules, and aligning multiple procurement processes have stretched schedules and forced design iterations. Those challenges shaped a core lesson of the pilot: plan for extra time, be ready to adapt, and use interim actions to keep learning and stakeholder buy-in alive.

3.3. Pilot Project in Dornbirn

Main pilot goal

Quantify and clearly demonstrate how nature-based solutions—especially tree shade and unsealed surfaces—reduce urban heat stress in Dornbirn, and turn those measurements into actionable, public-facing insights (via CityMonitor) that guide municipal planning and raise citizen awareness.

Pilot overview

The Dornbirn pilot (Vorarlberg, AT) is a city-level demonstration that uses a LoRaWAN sensor network to quantify how nature-based solutions—especially tree shade and unsealed surfaces—cool urban spaces and reduce heat stress. Installed in and around Kulturhauspark (including a heat-island reference at the basketball court), the sensors record air temperature, relative humidity, and infrared surface temperature, from which perceived temperature (heat index) is calculated.

Early measurements show meaningful cooling effects (roughly ~5 °C lower perceived temperature and up to ~27 °C lower surface temperature in shaded/vegetated spots versus sealed areas in sun), illustrating the value of existing trees as a fast, measurable intervention. The project was co-created with the City of Dornbirn and FHV: after scoping and procurement through P1–P4, sensors were installed in April 2025 and data collection is ongoing.

Results are visualized for policymakers and citizens through the CityMonitor dashboard, informing spatial planning and awareness-raising. The solution is modular and scalable; additional use cases with the city's resilience team (e.g., fire brigade) and enhanced visualizations (incl. a 3D model and sealed vs. unsealed comparisons) are in development. Outreach has included media coverage and conference showcases, with a public event planned for early 2026, while risks around site suitability, data quality, and procurement have been managed through close coordination and staged implementation.

Pilot achievements & highlights

The Dornbirn pilot has moved from concept to execution and public impact: sensors were procured (order confirmed 13 Mar 2025), installed in April, and are now continuously collecting air temperature, humidity, and surface temperature data in Kulturhauspark and the adjacent heat-island basketball court, with results visualized on the CityMonitor platform for citizens and decision-makers.

Early readings clearly quantify cooling from trees and unsealed surfaces (≈4.78 °C lower perceived temperature; up to 27.2 °C lower surface temperature; ≈6.9 °C lower air temperature on a representative hot day), underscoring the value of shade and permeable surfaces and the heat retention of sealed areas at night. The pilot has been showcased widely—poster session at FHV's UDay (25 Jun 2025), coverage by ORF and Die Presse, and an accepted presentation at Naturgefahrentagung (6–8 Oct 2025) featuring a 3D model comparison—building local awareness and policy relevance, with a public event planned at inatura Dornbirn (www.inatura.at) in early 2026.

Operationally, the team completed site selection, overcame procurement delays, and established a maintainable measurement regime with regular site visits; methodologically, they aligned indicators with municipal systems and documented lessons on data compatibility and sensor-quality vs. density trade-offs.

Strategically, KPIs for usability and effectiveness are met (digital solution live; UI/UX defined with City + provider), replicability and scalability are underway (modular dashboard, expanding sensor network), and new use-cases with the city's resilience team (incl. fire brigade) are being implemented—positioning the pilot as a template for city-scale rollouts.

Pilot up-scale scope

Through the risk workshop and the pilot study, the team for disaster control in Dornbirn expressed the interest in an improved access to data and especially, in data visualization to enable better-informed decision-making in emergencies. As part of the measures described, selected climate resilience and disaster control-related content was integrated into and processed by the existing data and visualization platform of the city of Dornbirn (Citymonitor). The aim was to structure existing data sources, integrate additional relevant data points, and present them in such a way that they can be used in both operational and strategic contexts.

The implementation was carried out with consistent consideration of the existing technical, organizational, and specialist framework conditions of the city of Dornbirn. The project built on existing sensor technology, existing data flows, and established processes. Vorarlberg has always been exposed to natural hazards, such as flooding and thus, Vorarlberg already has a high level of protection against floods. Nonetheless, climate change intensifies the severity and the frequency of heavy rainfalls. This makes the implementation of robust monitoring and early warning systems not just important, but urgent, which is exactly the focus of this scale-up initiative.

The integration of content into Citymonitor serves to consolidate and supplement existing data sets for the city of Dornbirn and make them consistently usable for different applications. The structured processing of data creates a common overview of the situation, which supports both disaster control and other municipal departments in their decision-making processes.
The integrated content contributes in particular to:

- making climate and disaster control-related information centrally available facilitating the use of data in daily workflows
- making findings from existing measurement and monitoring activities visible – also to citizens
- creating a basis for the further use of data in future projects and use cases

Citymonitor acts as a central platform for consolidating, visualizing, and interpreting relevant data without replacing existing systems.

Two use cases were developed in iterative formats with the innovation management team of the city of Dornbirn and the city's emergency services:
Use Case A – Water levels and flood monitoring
Use Case B – Local weather data and microclimate
Both use cases are described in more detail in Pilot Project Supplementary report

Pilot KPI review

Evaluation dimension	Specific KPI	KPI Target value	Comments how KPI`s fulfillment is demonstrated
Usability of solution:			
Relevance	• Raises awareness of importance and effectiveness of nature-based solutions	1	Achieved – within the municipality, but also regarding the wider public
Coherence			
Effectiveness	• Implementation of digtial solutions, supporting nature-based approaches	1	Achieved – pilot study has been implemented; UI/UX guidelines were defined as cooperation between FHV/Dornbirn City & implemented with solution provider weavs/CityMonitor
Impact	• Assessment of micro-climate at the pilot study site, affected by nature-based solutions • Possibiltiy to replicate	1	Assessment of data is still ongoing Microclimate is not relevant for the upscale of the pilot study (different thematic focus). However, the possibility to replicate is given, since the integrated content is designed in such a way that future use cases can build on the same data structures. It should be emphasized that the entire solution is transferable and was not implemented as a stand-alone solution. The packages can be used by surrounding

			municipalities/cities, for example, thus supporting inter-municipal data exchange and cooperation.)
Up-scaling of solution			
Scalability & Replicability	• The scalability of the pilot study is given	1	Achieved - Modularity was implemented a key concept in the requirements assessment; the relevant data can be extended as modules across the CityMonitor platform and embedded in other solutions, including solutions targeted at Citizen awareness raising / citizen science. Through the upscale of the pilot, the scalability is achieved.
Community Awareness building			
Community Engagement	• An event will be organized to disseminate the results	1	Achieved - the pilot study was disseminated through 2 conducted workshops and site visits with relevant city officials, one workshop with the firebrigade, and a poster session at the Uday on the 25th of June. Further, the results will be presented at the Naturgefahrentagung in Dornbirn from the 6th until the 8th of October. Addtionally, another dissemination event is planned for the beginning of 2026 at the Inatura in Dornbirn. Moreover, the pilot study was disseminated through local media outlets. (achieved 5)

Lessons learned

Nature-based solutions (NBS) measurably cool cities, but surface type matters as much as shade—sealed areas retain heat (even overnight), while unsealed/vegetated areas enable cooling via infiltration and evapotranspiration. Methodologically, comparability is everything: place sensors in one park under similar macro-weather to isolate effects; plan for data compatibility with existing systems; and balance sensor quality vs. density given budget.

Operationally, schedule regular site visits for uptime and data integrity, and be mindful that wording shapes understanding — position this as a *digital solution supporting NBS* to avoid confusion. For delivery, public-sector procurement rules (≥3 quotes) can shift timelines; factor this into critical paths. For impact, visualization is as critical as measurement—clear dashboards translate technical readings into decisions and build awareness; the modular setup also supports scaling and replication across the CityMonitor platform and beyond.

The up-scale was initially not planned, thus the scale-up is a deviation of the original paln. However, heat and changes in the water cycle were identified as two of the main climate risks for the region and thus, it is extremely useful that through the Mission CE Climate project both climate risks were addressed and that the scalabiltiy of the pilot study was already demonstrated within the project`s lifetime.

3.4. Pilot Project in Pforzheim

Main pilot goal

Develop and implement a Citizen Toolkit focused on environmental monitoring and engagement within the Pforzheim area. This toolkit aims to empower citizens to contribute data and insights using IoT sensors, thereby fostering community participation in smart city initiatives and promoting environmental stewardship.

Pilot overview

The Pforzheim/Northern Black Forest pilot designs, tests, and scales a Citizen Toolkit for environmental monitoring that lets residents, students, and public bodies gather and use local climate/urban data via low-power IoT sensors and a shared enerchart dashboard over LoRaWAN (TTN/ChirpStack). Prototyped use cases include water-level (flood) monitoring, indoor/outdoor air quality, noise, soil humidity (with custom housings and payload decoders), indoor ambience/urban microclimate (with shielding tests), and traffic radar/people counting; each was deployed and integrated into dashboards.

The quintuple-helix team spans Hochschule Pforzheim, krumedia, WFG Nordschwarzwald, the City/municipalities, and citizens. After feasibility and prototyping in early-mid 2024 (including a v1 DIY toolkit), pilot operations and data collection continued through 2025 with a student campaign and a large public presentation on 6 May 2025 (~250 attendees), which triggered demand for a follow-up. Progress shows a robust, scalable architecture and strong stakeholder acceptance; main issue was theft of early water-level devices, with replacements/anti-theft hardening planned.

Interim KPIs indicate positive relevance, effectiveness, and impact—especially engagement—while formal efficiency and satisfaction metrics will be quantified next. Next steps are to complete the citizen-science rollout across the region, secure/replace water sensors, iterate the toolkit and dashboards based on 2025 learnings (e.g., shielding, decoders, alerting), measure KPIs rigorously (including surveys and telemetry), and host a Q4 results session to map a 2026 replication roadmap.

Pilot achievements & highlights

The pilot delivered a working end-to-end civic-sensing stack—LoRaWAN devices feeding an enerchart dashboard—validated in real conditions across five use cases (water level, air quality, noise, soil humidity, and indoor/urban microclimate). Most sensors have been running continuously; only early water-level units were lost to theft, prompting plans for secured replacements.

A “v1 Citizen Toolkit” with step-by-step guides was produced, with updates queued from subsequent field learnings. The approach for a wider citizen-science rollout was set with local partners, and a public presentation on 6 May 2025 drew roughly 250 attendees, surpassing awareness goals and generating demand for a follow-up. Data is already informing practical decisions—such as road-salt silo logistics, flood preparedness, green-space care, urban climate tracking, and mobility flows.

Key lessons include the robustness and scalability of LoRaWAN and the need for stronger device security. Interim KPIs indicate strong relevance and smooth technical operation, with user satisfaction to be quantified as the rollout expands. Overall, the pilot progressed from feasibility to stable, real-world sensing with a documented, citizen-ready toolkit and clear momentum for regional scaling.

Pilot KPI review

Evaluation dimension	Specific KPI	KPI Target value	Interim reached KPI value	Comments
Usability of solution				
Relevance	Pilot solution design is accepted by regional stakeholders.	2	Qualitatively achieved	Strong qualitative feedback: All regional stakeholders expressed satisfaction and acceptance during interviews and events. No negative feedback registered so far.
Coherence	Number of local/regional/national/EU strategies the pilot is aligned with.	2	Qualitatively achieved	Stakeholder and public feedback highlight the high relevance of the solution for local challenges; citizen science highly valued.
Effectiveness	Error Rate Percentage	2	Qualitatively achieved	Qualitative discussions and strategy mapping confirm alignment; final mapping to be completed as the project matures.
Efficiency	Task Completion Time	To be defined	Technically achieved	All technical components functioned without significant errors throughout pilot phase; stakeholders reported smooth operation during live demonstrations and daily use.
Impact	User satisfaction score	To be defined	Technically achieved	Processes from sensor setup to data handling run smoothly and quickly; both experts and citizen users report the system is efficient and easy to use.
Sustainability	Long-term sustainability of the pilot digital solution is ensured.	> 85%	Qualitatively achieved	All user responses during demo and events have been strongly positive; formal survey to be conducted after broader deployment.
Up-scaling of solution				
Scalability & Replicability	Replication Success Rate Definition: The percentage of attempts to replicate the pilot project's solutions or interventions in other contexts or locations that have been successful, indicating the replicability and transferability of the project.	To be defined	n.a.	Too early for KPI values; initial conversations with other cities and institutions show strong interest; groundwork for upscaling is positive.
Community Awareness building				
Community Engagement	Increase in Public Awareness Definition: The percentage increase in public awareness and understanding of the pilot project's objectives, activities, and benefits over a specified period	100 participants	Qualitatively achieved	Over 250 participants at main event; public enthusiasm and high engagement, especially regarding the citizen science component.
Educational & guidance materials	Citizen DIY toolkit	1	Qualitatively achieved	Toolkit well received; positive feedback from citizens, requests for more comprehensive guides noted, and further materials planned.

Lessons learned

Key lessons from the Pforzheim/Northern Black Forest pilot are that LoRaWAN is technically robust and cost-efficient for civic sensing, with The Things Network accelerating setup, security, and community scaling; this combination reliably supported real-time monitoring across use cases and is well suited for broader replication. Equally important, technology only creates impact when paired with citizen participation: engaging students and residents as sensor installers and informed users turned data into timely actions (e.g., salt-silo logistics, flood readiness, soil care, mobility insights) and built digital literacy and ownership.

The project also learned that user-centric dashboards are essential—they convert raw streams (air quality, soil moisture, traffic, occupancy) into understandable trends and alerts that inform municipal and everyday decisions. Operationally, clear roles, steady communication, and contingency plans matter; the theft of early water-level sensors highlighted the need for hardened deployments and rapid replacement strategies.

Finally, the pilot underscored the value of iterative improvement and early KPI discipline—documenting usability, coherence with local strategies, and satisfaction while more quantitative metrics (error rates, task times, replication success) mature during scale-up.

3.5. Pilot Project in Lignano Sabbiadoro

Main pilot goal

Institutionalize an inclusive, participatory climate-governance model in Lignano Sabbiadoro that turns co-created plans (beginning with Porto Casoni regeneration and the Urban Green Management Plan) into implementable actions, strengthening flood/heat resilience while building broad citizen awareness and acceptance.

Pilot overview

The Lignano Sabbiadoro pilot embeds participatory climate governance into everyday municipal practice by coupling strategic planning with hands-on co-creation and public communication. Centered on three strands:

1. Co-design of regeneration solutions for the flood-prone Porto Casoni area,
2. Drafting and adoption of a citywide Green Management Plan with an accompanying regulatory framework,
3. Public sustainability festival "Lignano 180°" Sustainability Festival that translates technical work into civic engagement

The pilot mobilizes municipal leaders, APE FVG, and a broad set of local stakeholders. It has delivered an approved masterplan for Porto Casoni, advanced the Green Plan from concept to implementation, and proven that well-curated public events can boost awareness and acceptance. Key lessons are the value of early, structured participation, pairing strategies with operational rules, and using culture and communication to sustain momentum. Next steps focus on finalizing and socializing the Green Plan's regulations, securing implementation funding for Porto Casoni, and institutionalizing the festival as an annual platform for climate action.

Pilot achievements & highlights

The Lignano Sabbiadoro pilot has delivered three standout results:

- Fully co-designed regeneration pathway for the flood-prone Porto Casoni area, culminating in a Masterplan approved by the City Council in October 2024 after an intensive participatory process that mapped 16 key stakeholder groups across ~20 meetings—building rare consensus and social licence for implementation while the municipality pursues funding.
- Citywide Green Management Plan developed by an external expert team and approved on 17/04/2025, with work now advancing on a participatory regulatory framework and targeted dissemination so the plan's rules, standards, and responsibilities can be operationalized.
- The launch of Lignano 180°, a two-day sustainability festival (13–14/06/2025) that drew around 800 participants and showcased both the Green Plan and Porto Casoni process—turning technical climate work into a civic conversation and positioning the city to make the festival annual. Together, these actions prove the pilot's core value: institutionalizing inclusive climate governance that couples strategic planning with public engagement to strengthen resilience and community buy-in.

Pilot KPI review

Evaluation dimension	Specific KPI	KPI Target value	KPI value reached	Comments
Usability of solution				
Relevance	Number of climate risk hotspots identified within the SECAP and the Risk & Vulnerability Assessment performed under Mission CE Climate addressed by the pilot demo actions	2	5 (fires, heat waves, flooding from rainfall/overflowing/storm surges)	Reference in planning documents for demo action (i) and (ii)
Effectiveness	Implementation of executive project for Porto Casoni Adoption of Green Management Plan	1 1	1 0	Approved in City Council (Giunta Comunale) Approved by the City Council on 17.04.2025
Impact	Reduced number of flood events Enhanced quality of ecosystem services provided by urban green spaces Promotion of information campaigns and awareness events	0 Climate parameters to be identified +20% usability by citizens and tourists 2 events / year	TBD TBD TBD 2 events in 2024 (1 information campaign + 1 awareness events)	Flood monitoring system Long-term assessment of ecosystem services Attendance sheet and pictures
Up-scaling of solution				
Integration	Number of measures which integrates technological, social, economic, environmental systems. All foreseen demo actions embrace a multidisciplinary perspective.	3	2 (Porto Casoni Masterplan and Urban Green Plan)	Planning documents for demo action (i) and (ii); programme for demo action (iii)
Community Awareness building				
Community Engagement	Number of people participating in the participatory processes for demo action (i) and (ii) Number of people participating in demo action (iii)	> 50 >100	60-70 >150	Attendance sheet and pictures Pictures

Lessons learned

The pilot showed that early, structured participation is decisive for trust, legitimacy, and durable buy-in—Porto Casoni's co-design proved that engaging 16+ stakeholder groups upfront turns a contested site into a shared project. Strategy must be paired with operations and outreach: the Green Management Plan only becomes real when backed by a clear regulatory framework and proactive communication that brings citizens into the rules they'll live with.

Integration multiplies impact: the Lignano 180° festival connected planning, place-based participation, and public narrative, making climate governance as much cultural as technical. Visible political ownership (mayor/councillor presence) sustained credibility and attendance, and cross-actor coordination (municipality, consultants, APE FVG, regional bodies) proved essential. Pilot actions are catalysts, not endpoints: approval triggers the harder work (funding builds, regulation, and continued engagement) while timelines must anticipate external procedures (e.g., added Strategic Environmental Assessment requirements).

Together, these lessons define a replicable model: plan with people, codify the "how," communicate relentlessly, and treat pilots as stepping stones to long-term, adaptive governance.

3.6. Pilot Project in Island of Brač

Main pilot goal

Reduce non-revenue water/distribution losses on Brač's public water network by **at least 10%**—using modern metering, telemetry, and systematic leak detection—to boost drought resilience, service reliability, and energy efficiency.

Pilot overview

The MISSION CE CLIMATE pilot on Croatia's island of Brač strengthens climate-resilient water management by cutting distribution losses in the public network. Led by Split-Dalmatia County with EIHP and Vodovod Brač, the project replaced aging turbine meters with magnetic-inductive meters, added a portable ultrasonic meter, and expanded a telemetry-enabled logger fleet, forming a dedicated Water Loss Unit to run a leak-detection workflow (sector isolation, loggers/vibrophones, geophone pinpointing).

Equipment was jointly financed and installed across 15 key reservoirs representing most of the island's storage, with night-time works minimizing service disruption. Procurement concluded in late 2024; installations and on-site training ran through early 2025, followed by validation and a public pilot presentation in September 2025. Despite budget pressure, a split-financing approach and flexible procurement mitigated delays. Early results show losses reduced from roughly 26% to about 20%, on track toward ~15%, meeting the ≥10% reduction KPI and aligning with regional climate and energy plans.

The pilot also achieved its communication goals through stakeholder events and citizen guidance materials, and it has produced a standardized, replicable toolkit for other utilities. Next steps focus on completing a 12-month validation dataset, embedding methods in verification tools, and scaling dissemination to at least ten regional water companies.

Pilot achievements & highlights

The Brač pilot delivered a step-change in climate-resilient water management by replacing aging turbine meters with 15 magnetic-inductive meters, adding a portable ultrasonic meter, and expanding a telemetry logger network (with a new Water Loss Unit to run systematic leak detection). All procurements and installations were completed with night-time works to avoid service disruption, staff were trained on site, and split financing between the county and utility safeguarded delivery despite budget pressure. Early operational results show distribution losses cut from roughly 26% to about 20%—surpassing the project's ≥10% reduction KPI and trending toward ~15%—while improving service reliability and energy/operational efficiency.

The team met outreach targets through stakeholder events, citizen guidance, and a public pilot presentation in September 2025. With a validated workflow and toolkit now in place, the pilot is positioned for replication across regional utilities as the 12-month performance validation and broader dissemination continue.

Pilot KPI review

Evaluation dimension	Specific KPI	KPI Target value	Interim reached KPI value	Comments
Usability of solution				
Relevance	SECAP of the island of Brač and Annual report on the condition of the water supply system of the Brač water supply system	Annual report, implementation of SECAP	0	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. To be implemented by the end of 2025-SDŽ
Coherence	A number of local/regional/national/ European strategies the pilot is aligned with?	2 strategies	Done	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. SECAP and Split-Dalmatia County Climate Change Mitigation and Adaptation Program
Effectiveness	Recorded losses in the water supply system in the pilot area	Reduction of losses by 10%	Done	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. See verification.
Evaluation dimension	Specific KPI	KPI Target value	Interim reached KPI value	Comments
Up-scaling of solution				
Integration	Integration of pilot project results (verification of adaptation measures report) into the new tools for verifying adaptation measures.	1	0	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. To be implemented by Vodovod Brač the end of 2025-SDŽ
Scalability & Replicability	Number of water supply companies in the region that are familiar with the results of the project	10	0	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. To be reached by the end of 2025.webinar organized by SDC
Community Awareness building				
Community Engagement	People familiar with pilot project implementation and results on adaptation to climate change.	30	Done (50)	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. The two promotional events organized on the 25-26.9 Brač (see KPI below)
Trainings & Dissemination events	Number of organized dissemination events	2	Done (2)	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. Prvi 1.10.2024. 25-26.9 Brač Attendance list. Mission CE Climate presentation to local stakeholder. Participation on the local festival FLAG Supetar. news, video, photo
Educational & guidance materials	A number of dissemination materials (articles, news, reports...)	5	Done (more than 5)	The target value for KPIs is expected to be reached in Period 5 after the full implementation of the pilot project. Online pilot project presentation on the web, LinkedIn, promotion material-A guide for households, providing island and county residents with practical advice on reducing energy and water consumption.

Lessons learned

Key lessons from the Brač pilot center on planning, data, and people. Upfront split-financing and staged procurement de-risked budget erosion and supply-chain delays, while pre-installation electrical/metal works and night-time interventions minimized service disruption.

Magnetic-inductive meters proved far more reliable than aged turbine meters—especially at low flows—when paired with a denser logger network and a clear leak-detection workflow (isolation → logging → vibrophone/geophone pinpointing). Data quality is pivotal: establish a clean baseline, instrument priority nodes first, and allow a full seasonal cycle for validation before declaring savings.

Creating a dedicated Water Loss Unit accelerated response times and ensured that new tools (including the portable ultrasonic meter) were used. Integration with existing SCADA/telemetry should be planned early, with simple dashboards for operators. On an island system, logistics and timing matter—schedule heavy works outside the tourist peak and keep spare parts and alternative specs/vendors ready.

Stakeholder engagement (utility staff training, municipal briefings, citizen guidance) increases acceptance and sustains results. For replication, start small with the highest-leverage reservoirs, standardize documentation and KPIs, and treat the pilot as a living testbed that continuously feeds operational playbooks for other utilities.

4. Pilots`implementation evidence

Annex 1: Detailed evidence of implementation of pilot in Košice
Annex 2: Detailed evidence of implementation of pilot in Maribor
Annex 3: Detailed evidence of implementation of pilot in Dornbirn
Annex 4: Detailed evidence of implementation of pilot in Pforzheim
Annex 5: Detailed evidence of implementation of pilot in Lignano Sabbiadoro
Annex 6: Detailed evidence of implementation of pilot in Island of Brač
Annex 7: Pilot Project Supplementary report of pilot in Dornbirn