

DEFINING AND VALIDATING IMPACT

Knowledge Hub

Methods for Stakeholder-supported Monitoring and Evaluation



CUE



DUT

EUROPEAN PARTNERSHIP



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A collection of methods from DUT-funded projects

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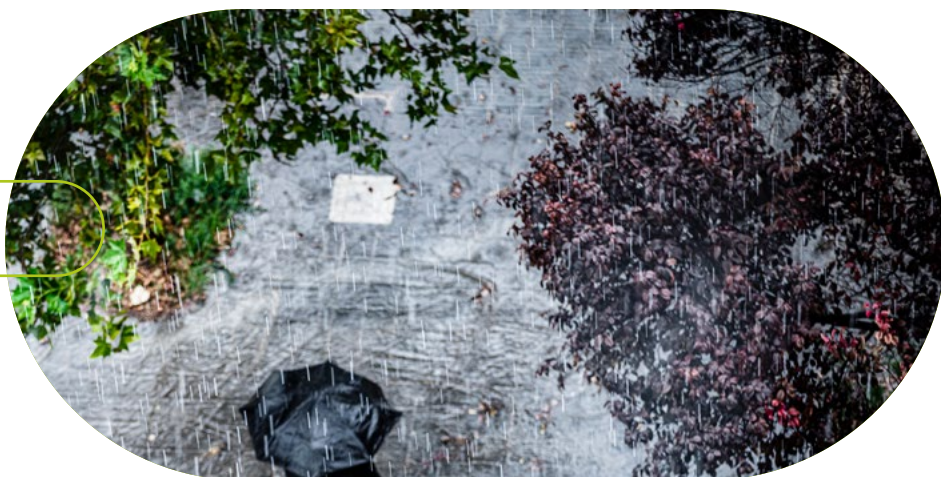
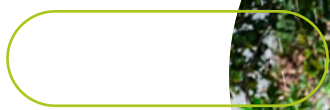


This publication is a collection of methods from seven DUT projects: B_GREEN, CABA, CirCoCreation, DECUB, EDITUA, NATURGO, and Urban ElementTREE.

The methods, tested and developed by DUT-funded projects working on Circular Urban Economies Transition Pathway (CUE TP), can be used to involve stakeholders at different moments, from early-stage solution exploration, to hands-on data collection, and participatory evaluation.

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KEY MESSAGES

- Monitoring and evaluation (M&E) allows for knowing whether an urban intervention works. Without structured M&E, cities risk investing in interventions that never get checked, adjusted, or improved.
- Stakeholder involvement in M&E can strengthen each phase of the evidence cycle: from deciding what to measure, to collecting data that reflects local reality, and evaluating whether interventions achieve their goals. It can establish a more effective and affordable M&E cycle, but it must be targeted: involve the right people, at the right moment, for the right purpose.
- The methods in this collection were developed and tested within DUT projects, in urban contexts across Europe, such as Strovolos (Cyprus), Zaragoza (Spain) and Sundsvall (Sweden). Some are ready for adoption whereas others are promising pilots worth following.



WHY STAKEHOLDER-DRIVEN MONITORING AND EVALUATION MATTERS

Urban interventions, whether greening projects, circular construction initiatives, or climate adaptation measures, are long-term commitments of public resources. Their effects are often complex, an intervention that improves one thing, such as increased tree canopy, may have unintended consequences for something else, e.g. rising property values. The Plan-Do-Check-Act (PDCA) cycle is a standard framework in project management: planning an intervention, implementing it, checking whether it is on track, and adjusting it accordingly. Monitoring and evaluation (M&E) is the 'Check' and happens along an evidence cycle: first deciding what to measure, then collecting the data, and evaluating it. Structured M&E allows cities to track progress against their stated goals, identify unintended effects early, iterate their approach, and plan further improvements.

Beyond the technicalities, M&E is also a social exercise. Overseeing urban interventions effectively calls for a shift from top-down institutional monitoring towards more networked approaches, where citizens, practitioners, and policymakers all play an active role in governing and managing cities. Urban spaces are shared by diverse actors, with different understanding, interests, and relationships to the places being transformed. Because of the diversity of these actors, the knowledge is fragmented.

Strategic stakeholder involvement in the process bridges this gap by offering:

- **Legitimacy:** Integrating local knowledge ensures that assessments reflect reality.
- **Inclusivity:** Considering different perspectives in the evaluation of strategies ensures that chosen interventions match real social, economic, or environmental needs.
- **Stakeholder capacity:** Involvement strengthens communities' understanding of indicators and circular or greening solutions.
- **Buy-in:** Collaborative evaluation increases trust and commitment to long-term implementation.
- **Cost-effectiveness:** Stakeholder involvement helps identify feasible solutions early, and avoid ineffective ones.

The key is selective engagement and good timing. By focusing on those most affected (end-users) and those with the power to scale change (policymakers and constructors), at the right time in the evidence cycle, cities can turn M&E from a chore into a strategic asset.

SEVEN TESTED APPROACHES FOR THE EVIDENCE CYCLE

This collection shows methods developed by DUT-funded projects working on Circular Urban Economies to involve stakeholders at different moments, from early-stage solution exploration, to hands-on data collection, and to participatory evaluation.

DEFINING THE END GOAL

Before an intervention is implemented, stakeholders can help define what success looks like. This includes identifying which Key Performance Indicators (KPIs) matter, validating whether proposed KPIs reflect local realities, and evaluating potential solutions using participatory tools. Involving stakeholders at this stage ensures that what gets measured is actually relevant, and that the chosen direction has acceptance from those who will be affected.

1. Urban and built environment indicator validation

Bridging the gap between technical impact indicators and the human experience of city biodiversity.

- **The goal:** A street might look green on a map but feel barren to a resident. The B_GREEN project validates if standard indicators, such as green cover or sealed surfaces, actually reflect the sensory experience of people in historic centres.
- **How it works:** Beyond focus groups, debates, surveys, interviews, and mapping workshops, a main relevant activity is the guided walk. Participants visit specific urban points, capturing photos and keywords that describe the space. This georeferenced “lived data” is then overlaid with GIS maps to identify where scientific data and human perception diverge.
- **Who is involved:** Daily users (residents, workers, students) and the planners who manage these urban spaces.
- **Outcome:** A method for validating indicators locally, ensuring they reflect both technical measurements and residents’ experience of urban biodiversity.

📍 **Tested in:** Strovolos (Cyprus), Naples (Italy), Coimbra (Portugal) and Cuenca (Spain).

Readiness: The Knowledge Hub platform will be available in late 2026, incorporating the data used in the urban biodiversity statistical analysis and residents’ perception-based contributions. The **validation methodology** will be made available to support its replication and scalability in other European contexts.

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2. Evaluating potential nature-based solutions (NbS) using participatory tools

Using digital decision-support tools to collectively evaluate potential solutions before implementation.

- **The goal:** To evaluate urban water management solutions, such as flood prevention, before committing public funds. Using the different stakeholders' definitions of success ensures the chosen path is feasible and supported.
- **How it works:** The project uses two tools: the [Urban Nature Explorer](#) (a low-barrier tool for projecting costs/benefits of NbS) and [InflowGo](#) (a high-precision AI tool for stormwater management scenario assessment). Stakeholders use these to debate trade-offs and find consensus on which solutions deserve investment.
- **Who is involved:** A mix of city officials, water utilities, private developers, and NGOs.
- **Outcome:** Two tools to understand stakeholder preferences for deciding on nature-based solutions.

📍 **Tested in:** Umeå (Sweden), Debrecen (Hungary), Piran (Slovenia), Florence (Italy) and Copenhagen (Denmark).

Readiness: The [Urban Nature Explorer](#) is live with a dedicated website and support team; [InflowGo](#) is operational and being refined. Both tools can be adopted in other European contexts.

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COLLECTING THE DATA

Once interventions are underway, stakeholders (citizens, industrial partners, local practitioners) can become active data gatherers. Crowdsourced and participatory data collection reduces the cost of maintaining accurate information over time, and integrates complementary local knowledge that institutional monitoring alone may miss. Participatory data collection does require fair transactions and transparent data handling.

3. Validation of prototypes through quality assessment

Testing redesigned circular construction materials in real settings through collective reporting of performance.

- **The goal:** To understand the quality of recyclable building materials in relation to traditional ones in real-world settings.
 - **How it works:** Circular material prototypes (such as heated floors) are placed in living labs in schools and universities. Stakeholders collect data on technical performance (strength, recyclability) alongside user experience (functional and emotional satisfaction).
 - **Who is involved:** Producers, researchers, and most crucially, the end-users where the prototypes are installed.
 - **Outcome:** A method for cities to monitor circular initiatives with stakeholders.
- This turns testing into a collaborative process rather than a closed-door lab experiment.

 **Tested in:** Sundsvall (Sweden)

Readiness: The **quality assessment method** is ready and its applicability for other recyclable building materials are being prototyped.

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4. A gamified platform for participatory data collection

Gathering citizen input on vacant spaces and green urban transformations.

- **The goal:** To prevent green gentrification (when improving the environment increases property values) by tracking resident needs in real-time and maintaining a transparent record of vacant urban resources, thereby strengthening responsible citizenship and promoting regenerative, socially just, urban development.
- **How it works:** The solution is the EcoUrban Composer, a platform built on GIS data with a game-like interface where citizens provide inputs by uploading geotagged photos. The platform uses a transparent simulation engine to score KPIs. Citizens and residents contribute data, validate assessments, and shape the vision for their own neighbourhoods without needing technical expertise. To ensure a fair exchange for the work done, users get rewarded with points they can use for participatory budgeting.
- **Who is involved:** Residents (data contributors) and municipal planners (facilitators).
- **Outcome:** A tool to track residents' preferences on spatial transformations and an up-to-date register of vacant spaces.

 **Tested in:** Poznań (Poland), Tallinn (Estonia) and Volos (Greece)

Readiness: Full release of **EcoUrban Composer** is expected late 2026. The system's reliance on open GIS data standards and modular architecture make it suitable for adoption across European municipalities if calibrated to local conditions.

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5. Mapping relationships to unlock material reuse

Combining material inventories and relationship mapping to understand what enables or blocks the reuse of urban construction materials.

- The goal:** Enable circular urban development by mapping how human relationships such as trust and willingness to collaborate determine whether urban construction materials get reused. The stakeholders' perspectives help to uncover systemic bottlenecks that raw material tracking alone cannot detect.
- Who is involved:** Researchers, public authorities, construction and recycling actors, legal experts, digital platform providers, and a broad ecosystem of stakeholders including businesses, waste operators, and municipal departments.
- How it works:** Stakeholders complete a dual questionnaire. First, mapping relationships: identification of partners and assessment of communication, trust, and data sharing. Second, material flows: what materials are being handled, in what quantities, and at what quality. These data are then combined in a network analysis matrix, in which the stakeholders are represented as nodes. The connections between them reflect both the strength of the relationship and the volume of materials exchanged.
- Outcome:** A validated implementation guideline and diagnostic tool that reveals how stakeholders recycle, interact, and exchange materials. It identifies collaboration patterns, trust structures, and system bottlenecks, while highlighting weak links and opportunities for circular loops. This stakeholder-integrated urban material cadastre supports the development of a local collaborative circular economy network.

Tested in: Waedenswil (Switzerland), Maribor (Slovenia) and Ankara (Turkey).

Readiness: The **mapping method** is currently being tested and refined in three local case studies. It relies on well-established survey tools and network analysis software and is designed to be transferable.

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VALIDATING DATA AND EVALUATING RESULTS

When data has been collected, stakeholders can help make sense of it. They can verify that modelled data matches their lived reality, interpret what the data means in context, and evaluate whether interventions are meeting their goals. Digital tools such as simulations and digital twins can support this by making complex data accessible and explorable.

6. Participatory Digital Twin for circular regeneration

Visualising the trade-offs of urban renovation at the urban block scale through digital scenarios.

- **The goal:** Deciding what is the most suitable urban block decarbonisation strategy considering its surrounding conditions. A Participatory Digital Twin method helps stakeholders see which strategy (e.g. reusing materials from demolition, choosing softer retrofit options over full demolition, or selectively deconstructing parts of a building) works best given the existing buildings, heritage constraints, costs, community needs, and other environmental issues.
- **How it works:** Using a digital twin at the block level, stakeholders explore “what-if” scenarios. The twin visualises environmental and economic impacts, allowing the community to flag things the model might miss, such as social dynamics or local heritage values, and to reach a context-adapted solution.
- **Who is involved:** Authorities, planners, and local community representatives.
- **Outcome:** A context-sensitive evaluation framework for circular urban renovation.

📍 **Tested in:** Heerlen (Netherlands), Verviers (Belgium) and Zaragoza (Spain)

Readiness: A **Participatory Digital Twin** is in development within Living Labs in Heerlen, Verviers and Zaragoza. The method is designed to be transferable to other urban contexts.

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7. Validating tree monitoring methods through municipal co-design

Ensuring that high-tech tree data is accessible and useful for municipalities.

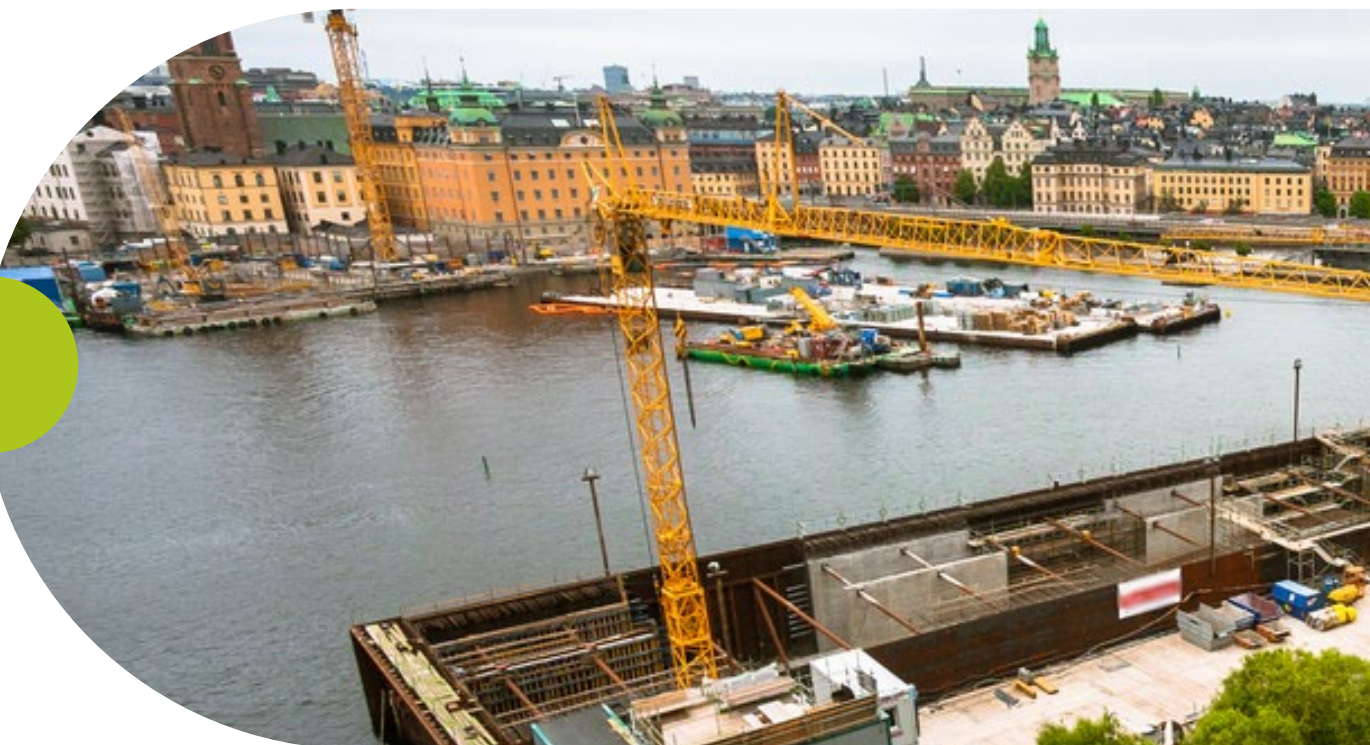
- **The goal:** To provide cities with affordable, reliable ways to monitor tree health and environmental performance.
- **How it works:** A co-design process that identifies local monitoring needs and combines existing digital resources with emerging low-cost environmental monitoring methods. Stakeholders compare and integrate institutional data with additional data collected through field protocols based on affordable techniques, mobile tools and community-generated observations, assess whether methods are feasible in everyday municipal practice, and indicate what kinds of outputs are most useful for maintenance and planning decisions.
- **Who is involved:** Green infrastructure managers, planners, and citizen initiatives.
- **Outcome:** Stakeholder-validated monitoring workflows that municipal staff can apply in everyday practice, built on affordable tools and existing datasets.

📍 **Tested in:** Aarhus (Denmark), Antwerp (Belgium), Florence (Italy), Gdańsk (Poland) and Gothenburg (Sweden).

Readiness: Testing of the **municipal co-design process** is ongoing in five Living Labs, supported by stakeholder workshops and interactive workflow sessions involving municipalities, practitioners, and community actors. The approach has strong potential for transferability and adoption across diverse European urban contexts.

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FINAL REMARKS

The methodologies collected in this publication are in some cases still under development. All seven projects are ongoing, and the results will continue to inform and refine the methods described. All projects are committed to integrating human experience alongside technical data, whether that means validating model outputs against lived experiences, ensuring that collected data is actionable for the people who maintain cities day to day, or using digital tools to make complex trade-offs visible and manageable.

Monitoring and evaluation (M&E) is indispensable for improving urban sustainability. Objective indicators are required to adjust policies in response to real-world complexity and uncertainty. This is critical in urban systems, where interventions often produce non-linear results. High stakeholder involvement approaches improve the quality and validation of data. When stakeholders are involved in defining indicators and interpreting results, outcomes are more likely to be trusted and acted upon by communities and institutions. These methods help to prioritize and select cases for financing with the highest desired impact.

Timing and simplicity are decisive. Stakeholders engage most productively when they are involved at the right moment, not presented with solutions before they have understood and seen the problem. Equally, keeping questions simple, open and accessible is what makes genuine broad participation possible.

Taken together, these projects point towards something larger: the need to move beyond top-down monitoring towards governance models where residents, practitioners, and institutions share responsibility for tracking and improving the cities they inhabit. It shows that we can move from 'what do we want to know?' and 'what can we measure?' towards 'what do *stakeholders* need?'. For complex urban sustainability challenges, stakeholder-supported M&E is not an add-on, it is what makes the process work.





This publication is an output from the Knowledge Hub. The Knowledge Hub is DUT's instrument to gather a knowledge community, capitalise on project results and facilitate the transfer of the project results to practitioners. The goal is to move beyond individual project results and create a collective body of knowledge that can be directly applied to urban challenges.

This collection of methods was developed with input from projects B_GREEN, CABE, CirCoCreation, DECUB, EDITUA, NATURCO, and Urban ElementTREE. All have been funded under the Driving Urban Transitions Partnership, which has been co-funded by the European Commission. The publication content is the authors' own overview of methods in DUT projects and does not necessarily represent the views of DUT.

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