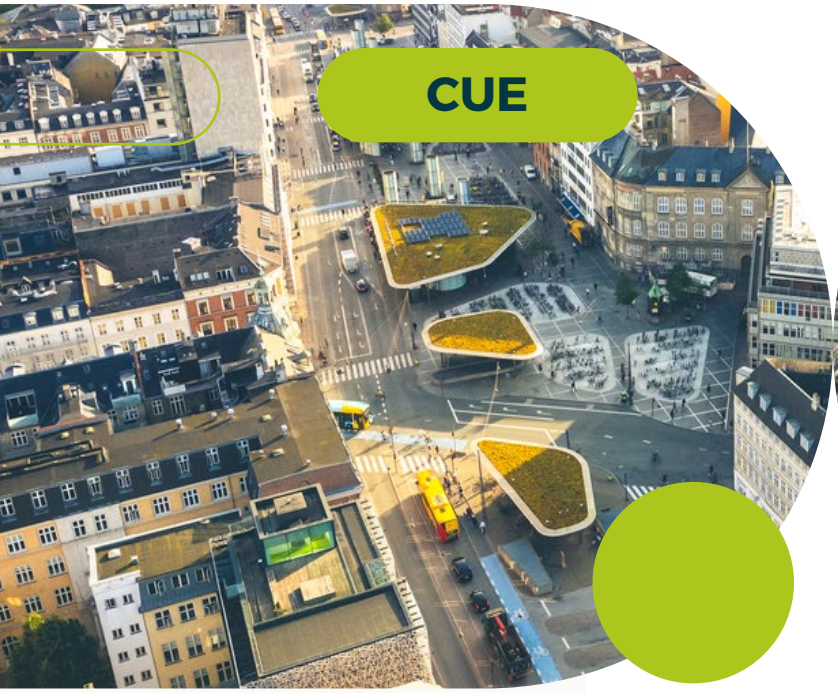

CUE

Knowledge Hub

Practice recommendations
June 2026

This brief focuses on establishing a robust and integrated circularity framework; grounding circularity in local contexts and communities; and translating circularity into policy and action.

All recommendations were developed with input from five DUT projects (aRTes, B_Green, CABE, MAINCODE, and Urban-CoLLaR).

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BEST PRACTICES: How to Assess Circularity in the Urban Built Environment

KEY MESSAGES

- Circularity is mainly assessed at building level, overlooking system-wide impacts. Most indicators focus largely on environmental aspects, with limited social and governance coverage. These indicators are often used for reporting.
- As a possible solution, authors propose to adopt multi-scale, integrated frameworks combining environmental, social, and economic indicators. Authors also suggest supporting the process with stakeholder engagement, digital tools, and real-world testing.
- Urban circularity developers should embed indicators into planning, investment, and decision-making processes. Ensure alignment, transparency, and local adaptation through participatory approaches.
- Embedding indicators will result in better decision-making enabling a shift to circular systems, more holistic outcomes and stronger scaling of circular solutions.

DUT

EUROPEAN PARTNERSHIP

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INTRODUCTION

The built environment, including individual buildings, neighbourhoods, and cities, plays a key role in pursuing circularity in our society. Traditionally, the construction sector has followed a linear 'take–make–dispose' model, significantly contributing to climate change, resource depletion, and waste generation. To address these challenges, the concept of a circular economy is increasingly applied to buildings and cities.

The Circular Cities and Regions Initiative (CCRI), supported by the European Union within the framework of the Circular Economy Action Plan, brings together several existing initiatives and tools to support the circular economy across different levels of the built environment. Guiding tools for circularity emphasise the importance of Life Cycle Thinking (LCT) and a multi-stakeholder approach.[1]

At its core, circularity aims to keep resources in use for as long as possible, extract maximum value from them, and recover materials at the end of their life so they can be reused, repaired, or recycled. However, to move from ambition to action, we need ways to assess the potential impacts and benefits of circular solutions on the urban built environment. This is where circularity assessment frameworks and indicators come in.

KEY CONSIDERATIONS IN CIRCULARITY ASSESSMENTS

Circularity assessment frameworks guide 'circularity developers' and other stakeholders towards identifying and implementing impact solutions. These frameworks can be articulated in different ways, depending on their purpose, and may incorporate a variety of tools. Circularity indicators are among these tools. They help assess the degree of circularity of a building, neighbourhood, or city. Specifically, **circularity indicators provide information on how effectively resources are managed throughout the life cycle, from material extraction and construction to use, renovation, and end-of-life, including eventual recirculation into the built environment.**

Circularity assessment frameworks typically address one or more of these five interconnected dimensions (Li et al., 2025), either simultaneously or separately:

1. environmental: emissions, energy use, water use, land use, and material efficiency;
2. economic: life-cycle costs, cost savings from reuse, and long-term value creation;
3. social: health, comfort, wellbeing, inclusion, and community participation;
4. technical: durability, adaptability, and ease of disassembly;
5. managerial: planning, data management, policies, and stakeholder collaboration.

In this regard, there are a few important aspects to consider:

First, existing circularity frameworks tend to focus primarily on the building scale, often overlooking interactions between the buildings and their surrounding context, as well as larger territorial scales such as districts and entire cities. Yet circular solutions implemented at the building level can generate effects (positive or negative) beyond their immediate boundaries. For this reason, a multiscale perspective that assesses performance across buildings, neighbourhoods, and cities should be preferred to capture systemic impacts and trade-offs.

Second, indicators can be developed for each dimension of circularity to assess the specific performance of circular solutions. However, most existing indicators focus heavily on environmental aspects. Social and managerial dimensions are relatively less developed. Furthermore, as circularity is a complex concept, no single indicator can fully capture all its dimensions. As a result, researchers and practitioners use different types of indicators.

A key priority is therefore the development and testing of integrated indicator sets that capture environmental impacts (e.g., lifecycle-based emissions, resource efficiency, waste prevention, circularity performance) alongside socio-economic and quality-of-life dimensions, including social acceptance of reused materials, and impacts on vulnerable groups.

Third, it is important to define the robustness of the indicators and how we could assess how robust different indicators are. Robust indicators should be based on sound methodologies, consistent data sources, and clearly defined system boundaries, ensuring that results are comparable and suitable for informing policy and decision-making.

[1] European Investment Bank. Towards European Circular Cities: A Guide for Circularity in the Urban Built Environment, 2024.

TYPES OF CIRCULARITY ASSESSMENTS AND BEST PRACTICES

Three main types of circularity assessment can be identified in the literature: quantitative, semi-quantitative, and qualitative (Li et al., 2025).

Quantitative assessment methods are based on numerical data and calculations. They are widely used because they appear objective, and their results are easily comparable across projects.

Many quantitative methods rely on Life Cycle Assessment (LCA), a standardised method that evaluates environmental impacts throughout the life of a building or construction project. LCA-based indicators are especially common for assessing emissions, energy use, and resource depletion (e.g., Global Warming Potential).

Some quantitative indicators aim to summarise circularity in a single score, such as the Building Circularity Index (BCI). These indicators typically combine data on material inputs, waste outputs, lifespan, and design-for-disassembly features into one value. While convenient for comparison, such composite indicators can hide important details and assumptions.

Best practice: Quantitative indicators are most useful when calculation methods, system boundaries, and data sources are clearly defined and transparent.

Semi-quantitative assessment methods sit between numerical data and more nuanced calculation methods. They use scores or ratings to assess whether certain circularity criteria are met.

Semi-quantitative methods often rely on binary scoring (yes/no) or ordinal scales (e.g., 0–5). They are especially useful for aspects that are hard to measure precisely, such as design quality or management practices. However, these methods and respective indicators can be subjective if scoring rules are unclear or depend heavily on expert judgement.

Best practice: Use well-defined scoring criteria and document how scores are assigned to improve consistency and repeatability.

Qualitative assessment methods describe circularity using descriptive criteria rather than numbers. They typically focus on themes such as circular management, stakeholder engagement, governance and planning processes, education, and awareness.

Qualitative methods are particularly important for social, cultural, and managerial dimensions of circularity, which are often overlooked but critical for real-world implementation. However, qualitative methods are less easily standardised compared to quantitative ones. Given the relatively high degree of interpretation, achieving comparable assessments can be challenging. Nevertheless, they provide essential context and highlight enabling conditions for circularity.

Best practice: Use qualitative indicators alongside quantitative ones, not as replacements, to capture the full picture.

Methodologically speaking, the assessment using different types of circularity indicators could be done through a combination of system thinking, mapping approaches, and multi-criteria analysis, integrating both quantitative and qualitative indicators.

By using circularity indicators thoughtfully – as part of an integrated, multi-dimensional assessment – stakeholders can better understand where improvements are possible and how the built environment can shift from a linear system to a truly circular one.

RECOMMENDATIONS

The following recommendations are organised into three thematic pillars to enhance clarity and coherence. This structure does not imply a hierarchy of importance or a strict sequence of implementation. Rather, the pillars are interdependent and mutually reinforcing, and their effective application depends on context-specific priorities, governance settings, and objectives.

Pillar 1

Establishing a robust and integrated circularity framework

1. Systematically refine and harmonise existing circularity indicators across governance levels, prioritising alignment over proliferation;

2. Embed circularity indicators within an integrated, multi-dimensional assessment framework to avoid fragmented or sector-specific evaluation;

3. Institutionalise the inclusion of environmental, spatial, social, and institutional dimensions in all circularity assessments;

4. Integrate circularity indicators directly into formal decision-making processes (planning, procurement, investment), ensuring they influence outcomes rather than serve as reporting tools;

5. Require indicator-based evaluations to explicitly identify trade-offs and synergies across environmental, social, and economic objectives.

Pillar 2

Grounding circularity in local contexts and communities

1. Conduct structured baseline diagnostics with experts and local stakeholders to capture ecological richness and socio-spatial dynamics before intervention. Implement systematic environmental monitoring using on-site measurement tools (e.g., temperature sensors, thermographic imaging) to assess performance over time;

2. Institutionalise participatory assessment methods to evaluate social perception, thermal comfort, and quality-of-life impacts;

3. Ensure continuous and meaningful stakeholder involvement throughout planning, implementation, and monitoring phases;

4. Operationalise biodiversity assessment using locally appropriate ecological indicators (e.g., bird census, habitat mapping);

5. Integrate socio-economic and urban morphology indicators into circularity assessments to capture spatial form, density, accessibility, and local economic dynamics.

Pillar 3

Translating circularity into policy and action

1. Establish transparent, publicly accessible criteria for the selection, weighting, and application of circularity indicators (for example, RACER, SMART, or CREAM criteria);

2. Align context-sensitive indicators with policy instruments to directly inform regulatory frameworks, funding priorities, and planning standards;

3. Use indicator outcomes to guide resource allocation, strategic prioritisation, and phased implementation;

4. Systematically analyse indicator results to identify enabling conditions, governance gaps, and structural barriers to circular transition;

5. Publicly document and disseminate circular practices developed through stakeholder consultation to enhance replicability and institutional learning;

6. Test and validate circularity indicators through real-world demonstration projects (e.g., urban regeneration, industrial reuse, disaster-waste management);

7. Use demonstration cases as learning laboratories to prevent unintended social or environmental trade-offs;

8. Integrate Nature-based Solutions (NbS) as a core component of circularity strategies to strengthen ecosystem service provision;

9. In relation to NbS, prioritise indicators that enhance heat regulation, water retention, biodiversity, and climate resilience, reducing long-term dependence on grey infrastructure.

CONTRIBUTIONS FROM DUT PROJECTS

The Driving Urban Transitions (DUT) operates through three interconnected Transition Pathways, of which one is Circular Urban Economies (CUE). All practice recommendations in this publication were developed by five CUE projects (aRTes, B_Green, CABE, CORPUS, FOCUSE, MAINCODE, Urban-CoLLaR). Authors aim to contribute with insights from projects on how to assess circularity in the urban built environment.

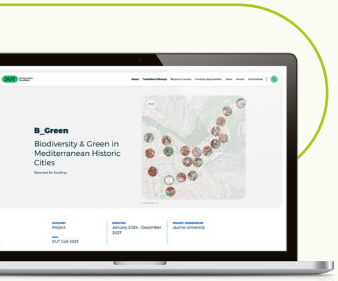
Existing circularity frameworks, such as MCI, BCI, and Madaster, as well as other sustainability tools such as Level(s), provide valuable support but are typically limited to specific scales (material or building) and primarily focus on environmental performance. By collecting best practices in this publication, DUT projects aim to extend these approaches and promote a **multi-scale assessment framework** that

integrates environmental, economic, social, technical, and governance aspects across buildings, neighbourhoods, and cities.It emphasises the need to combine different types of indicators, adapted to the local context.

DUT projects have explored approaches that can be defined as:

- **Multi-scale**: whenever possible, multiple scales are addressed simultaneously, or at least it is recognised that circular interventions at one scale have implications for other;
- **Integrated**: different circularity dimensions are considered together, preventing trade-offs, and if necessary, mixed methods for assessing circularity are adopted;
- **Systemic**: challenges and objectives are not addressed through siloes, but rather in an open and holistic manner.

The following examples illustrate how the recommended best practices are operationalised across the three pillars—establishing integrated assessment frameworks, grounding circularity in local contexts and communities, and translating circularity assessment into policy, decision-making, and action—through diverse realworld DUT projects.



B_Green

Valuing circularity and biodiversity in historic urban areas

B_Green addresses biodiversity loss and climate vulnerability in dense historic urban centers through context-sensitive and participatory approaches. The project combines transparent baseline diagnostics—including biodiversity monitoring and microclimatic measurements—with training and co-creation activities involving residents, experts, and local authorities. These processes lead to the development of small-scale nature-based interventions that enhance biodiversity, thermal comfort, and well-being while respecting cultural heritage values. By translating assessment results into local action plans, B_Green demonstrates how circularity biodiversity, and social engagement can be integrated into practical decision-making and replicated across similar urban contexts.

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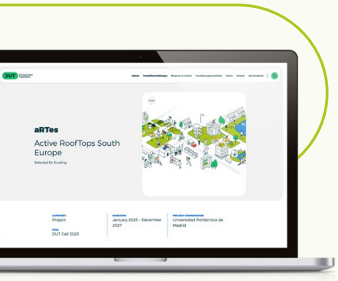

aRTes

Circularity as an emergent outcome

The aRTes project illustrates how circularity assessment can be embedded within an integrated, multidimensional framework, aligning with recommendations under Pillar 1. Rather than applying isolated indicators, the project combines physical rooftop interventions, digital tools, and regulatory analysis to assess environmental, social, technical, and governance dimensions in parallel. This integrated approach supports the identification of synergies and tradeoffs across scales and policy domains. A pilot project in Madrid consolidates these elements, demonstrating how circularity assessment frameworks can move beyond reporting and actively inform design choices, stakeholder engagement, and urban policy development.

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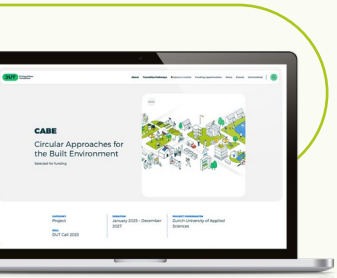

CABE

Building circular literacy for the construction sector

CABE demonstrates how circularity can be translated into practical action through capacity building and institutional learning, in line with the Pillar 3 recommendations. By combining structured educational materials with handson workshops using reclaimed construction materials, the project operationalises circular principles in real-world practice. Although not indicatordriven, CABE functions as a learning laboratory, in which circular practices are tested, reflected upon, and disseminated to future professionals. In doing so, the project complements formal assessment frameworks by strengthening the human and organisational capacities required for circularity to be implemented, scaled, and embedded in professional decisionmaking over time.

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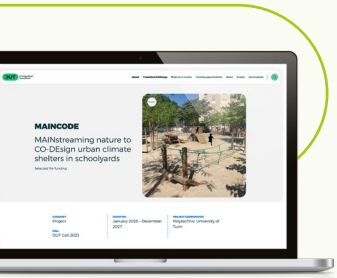

MAINCODE

Schoolyards as circular urban climate shelters

MAINCODE uses the transformation of schoolyards into Urban Climate Shelters as real-world demonstrations of circularity in practice. By integrating nature-based solutions such as vegetation, permeable surfaces, and shading systems, the project addresses heat regulation, biodiversity enhancement, and social well-being. Circularity is assessed through a multi-dimensional framework that combines environmental, social, and governance considerations and explicitly addresses trade-offs and synergies. Strong emphasis on local context, bas line assessments, and stakeholder participation positions schoolyards as learning laboratories, supporting the validation of circularity indicators and informing future planning and design decisions.

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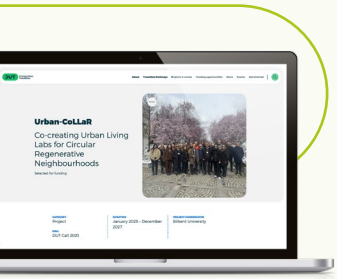

UrbanCoLLaR

Embedding circularity in large-scale urban regeneration

The MIND district in Milan demonstrates how circularity can be operationalised within large-scale urban regeneration. Building on a regeneration-as-circularity approach, the project integrates qualitative principles with measurable performance targets related to materials, waste, and carbon emissions. Life-cycle assessment, design for disassembly, and modular construction strategies support long-term resource efficiency. Through urban living labs, locally adapted circularity indicators are tested and embedded into formal decision-making processes. The case illustrates how circularity assessment can move beyond reporting to actively guide planning, governance, and investment in complex urban developments.

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An appendix for this publication is available at www.dutpartnership.eu

The appendix includes longer explanations of how recommended best practices have been applied in practice in the DUT projects.

ABOUT THE DUT KNOWLEDGE HUB

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.

Each DUT project is represented by an expert who spends at least 5 person-months on Knowledge Hub activities. The experts, together with the management team of the Knowledge Hub(s) and the specific Transition Pathway programme management, are set to:

- Contribute to the strategic development of the Transition Pathway
- Synthesise results in collaboration with other projects
- Develop publications and participate in specific events
- Communicate with the scientific community and stakeholders

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