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# Environmental assessments should focus on the needs of circular cities

Future areas for environmental assessment to support the transition to a sustainable circular economy



## RESULTS IN BRIEF

Circular economy is gaining momentum in cities. To ensure a sustainable circular economy, measuring the environmental performance of circular economy strategies is indispensable. However, do current environmental assessments support the prioritisation of sustainable circular strategies in cities?

**We find that environmental assessments miss out on several strategies that are prominent in urban circular economy practice.** These include:

- ▶ reuse and repair
- ▶ sustainable built infrastructure and urban land use
- ▶ green public procurement
- ▶ smart information and access technology

**To provide crucial insights on the environmental performance and implementation potential of these circular strategies, we recommend industrial ecologists and municipalities to:**

- ▶ collaborate and join up with urban systems experts
- ▶ quantify environmental impacts of entire urban systems for planning
- ▶ combine environmental with social and economic feasibility assessments



## WHY ASSESS CIRCULAR CITIES?

The circular economy (CE) has become a **popular strategy** for municipalities and other urban actors to turn their cities into healthier and more sustainable environments.

But research has shown that strategies associated with the CE such as recycling or extended lifetime of products are **not always environmentally friendly**, and can also bear environmental risks like increased energy use or emission of toxic substances (see Cantzler et al., 2020; Cullen, 2017).

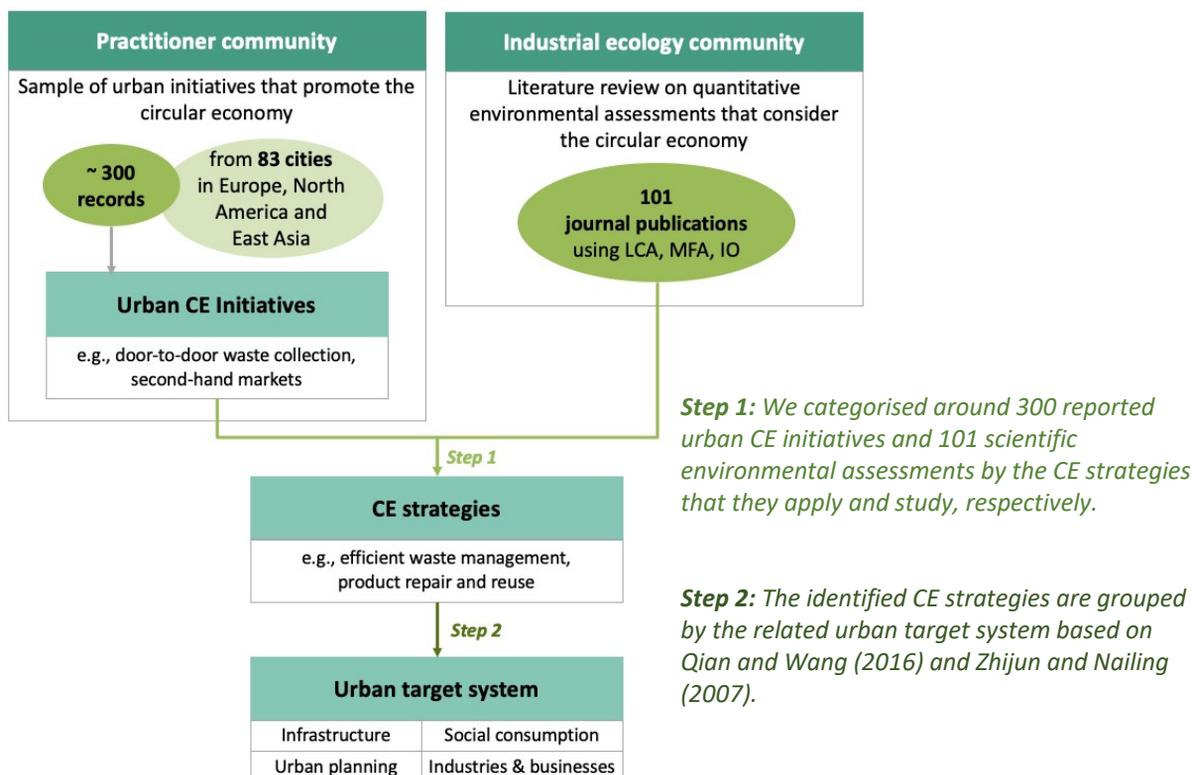
Thus, cities need environmental assessments that determine which strategies are really environmentally favourable, in other words, which strategies can effectively support cities' transition to more sustainable places.

By prioritising the environmental assessment of circular strategies that are implemented in cities, **industrial ecologists can hence have a substantial impact on the sustainable future of cities.**

## OUR APPROACH – COMPARING URBAN PRACTICE WITH RESEARCH

To help industrial ecologists identify relevant case studies for their assessment, we **identified** those **strategies** that urban practitioners apply, but which are not yet evaluated by environmental research.

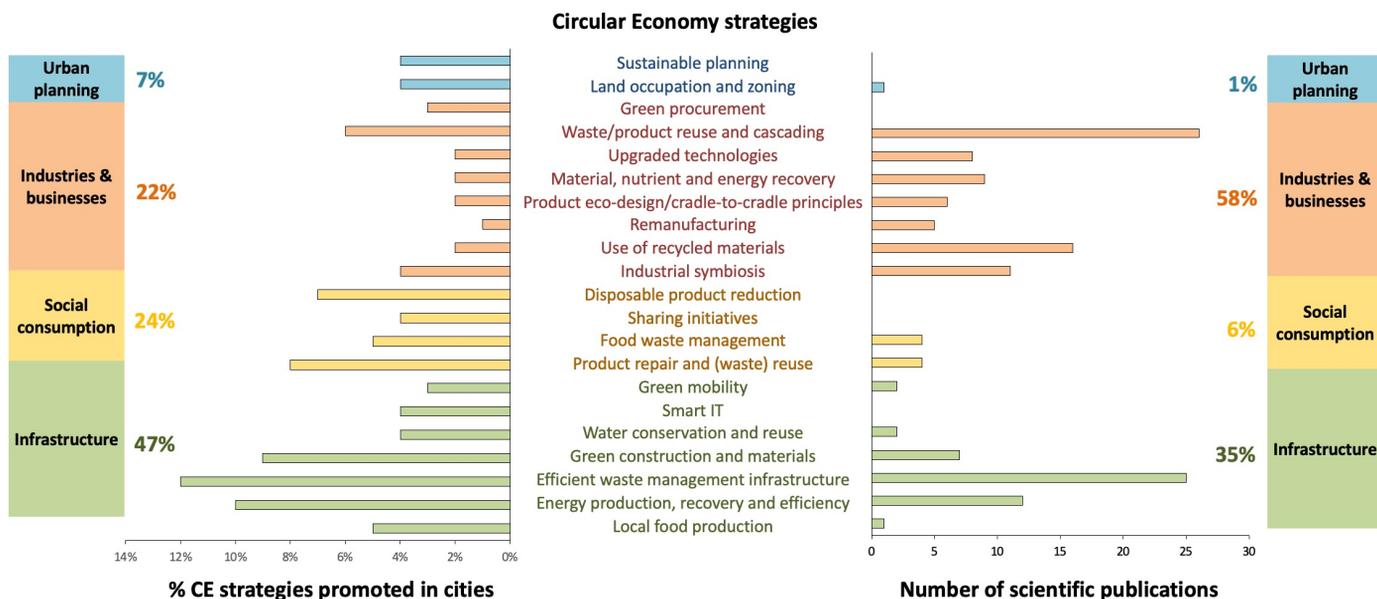
For this purpose, we **reviewed** urban CE initiatives and compared their strategies to the ones assessed by environmental research (Figure 1).



**Figure 1:** Circulus' research process including data collection and analysis.



## WHICH STRATEGIES NEED MORE EVALUATION?



**Figure 2:** CE strategies as promoted in cities, and as assessed in scientific publications.

The results of the analysis (Figure 2) reveal that practice and research both engage a lot with waste management in relation to the CE. But environmental assessment research is missing out on the evaluation of several other CE strategies popular in urban practice. These include:

- ▶ Strategies targeting the **urban consumption system** like reuse and the reduction of disposable products, which are promoted by around a quarter of the initiatives, but only evaluated by 6% of the assessments;
- ▶ Strategies targeting **urban planning** like land zoning or sustainable redesign of districts, for which only one environmental assessment could be identified.

Strategies targeting urban infrastructure and industries are generally well evaluated by industrial ecology research. But a few strategies related to these systems also remain under-evaluated:

- ▶ **Green procurement** and **smart IT** which did not feature in any of the identified environmental assessment in relation to the CE;
- ▶ Although **local food production** and **water conservation** are promoted in several cities, only a very small number of studies is assessing the environmental effectiveness of these strategies.

### LIMITATIONS

While these findings highlight some important avenues for future environmental assessment research, the study can only provide information within these conditions:

- ▶ Reports and assessments are limited to English, Spanish and German, up to 2017;
- ▶ Initiatives reported in the documents are not necessarily implemented;
- ▶ Initiatives targeting communication and political systems are not considered;
- ▶ Assessments are not limited to urban case studies, but include studies related to any circular economy targets

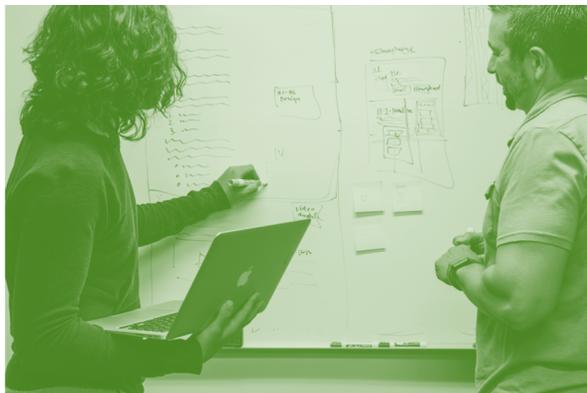


## WHAT CAN YOU DO? – OUR RECOMMENDATIONS

### INDUSTRIAL ECOLOGISTS & FUNDING AGENCIES

Since our analysis in 2017 some improvements have been achieved. Still, most of the gaps highlighted by our study have not been fully addressed yet. Especially, urban planning and the use of second-hand products in the urban context requires further assessment.

- ▶ More assessments are needed to quantify the **environmental impacts of urban systems** like entire neighbourhoods and of the impact of adjustable parameters in these systems to support planning decisions (see Lausset et al., 2019 for an example).
- ▶ **Collaboration with other urban systems experts and practitioners** may help to understand the innerworkings of the city to enhance the quantification of environmental impacts and benefits.
- ▶ Try to **combine environmental assessments with social and economic feasibility** assessments to efficiently support local authorities in their prioritisation efforts. For instance, recent studies provide examples of the importance to consider user preferences when making environmental recommendations (Toboso-Chavero et al., 2021).
- ▶ Once your research is done, **communicate** it in relation to concepts that are currently trending in practice to make your research attractive and accessible to urban practitioners.



### URBAN CE PRACTITIONERS & EXPERTS

Not all circular economy strategies are environmentally friendly, but environmental assessments can support you in finding the most effective strategy for your context.

- ▶ **Consult environmental assessment** research when drafting future plans and incorporate **basic evaluations** of the environmental effect in your process as a key to a sustainable city.
- ▶ Help researchers with determining the most environmentally friendly and feasible CE strategies. By **collaborating with researchers**, you can support the global transformation towards sustainability while also receiving context-based information on the best options for your city.



## FURTHER INFORMATION & SOURCES

Our full “**Circular economy in cities: Reviewing how environmental research aligns with local practice**” study can be found here: [doi.org/10.1016/j.jclepro.2018.05.281](https://doi.org/10.1016/j.jclepro.2018.05.281)

### **Environmental risks of the circular economy:**

Cantler et al. (2020). Saving resources and the climate?. [doi.org/10.1088/1748-9326/abbeb7](https://doi.org/10.1088/1748-9326/abbeb7)

Cullen (2017). Circular economy: theoretical benchmark or perpetual motion machine?. [doi.org/10.1111/jiec.12599](https://doi.org/10.1111/jiec.12599)

### **Urban circular economy target systems:**

Qian & Wang (2016). Circular Economy Cities, pp. 169-188. [https://doi.org/10.1007/978-3-662-48153-0\\_6](https://doi.org/10.1007/978-3-662-48153-0_6)

Zhijun & Nailing (2007). Putting a circular economy into practice in China, pp. 95-101. <https://doi.org/10.1007/s11625-006-0018-1>

### **Examples of environmental assessments filling the gap:**

Toboso-Chavero et al. (2021). Incorporating user preferences in rooftop food-energy-water production through integrated sustainability assessment. [doi.org/10.1088/2515-7620/abffa5](https://doi.org/10.1088/2515-7620/abffa5)

Lausset, Borgnes & Brattebø (2019). LCA modelling for Zero Emission Neighbourhoods in early stage planning. <https://doi.org/10.1016/j.buildenv.2018.12.034>

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The **Circular Economy Series** presents research results of the research group “Circulus - Opportunities and challenges of transition to a sustainable circular bio-economy”. The researchers are developing a comprehensive understanding of possible pathways to a circular economy in Germany and Europe. To this end, they combine perspectives from the social, environmental and engineering sciences to analyze the ecological and socio-economic consequences of the circular economy in various sectors.

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