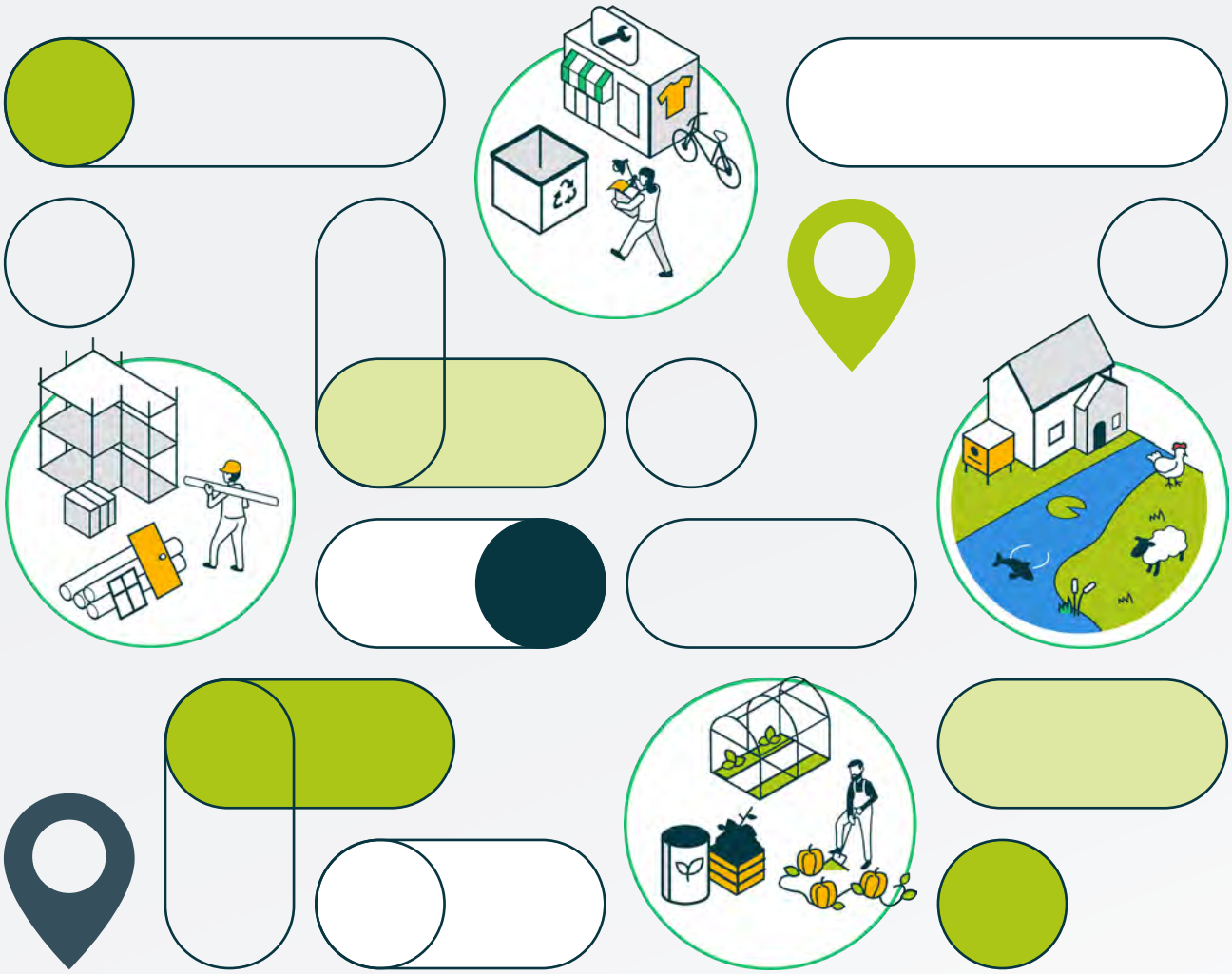
Driving Urban Transitions

EUROPEAN PARTNERSHIP

Mapping Circular Urban Economy Cases

A Method Toolbox for Data Collection and Visualization

Report from DUT's Circular Urban Economies Transition Pathway



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Driving Urban Transitions to a sustainable future

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The DUT CUE data collection is ongoing during 2024.
To submit a tentative case, please use the QR-code or link to reach the CUE Questionnaire:

https://forms.office.com/e/aDAy35iqK8ata

Contents

Summary

This report summarizes work carried out by Sweco in close collaboration with the EU programme *Driving Urban Transition Partnership (DUT),* through its *Circular Urban Economies Transition Pathway (CUE TP).* It serves to demonstrate the potential of a continuous mapping approach as a new work methodology for DUT, informing its practices as a partnership program serving to accelerate the transition to circular urban economy in Europe. An important part of the work was to illustrate the many approaches that are developing in Europe. The mapping approach has resulted in a *CUE Database* with more than one hundred cases across European cities and towns. This intelligent data collection will continue throughout 2024, therefore allowing DUT to further explore and develop a toolbox for data collection and visualization.

The DUT Partnership is one of many financial instruments for research and innovation within the EU Cities Mission, serving to accelerate climate transition in cities. The CUE Transition Pathway in DUT is based on regenerative design principles and offers a broad, integrated, interdisciplinary, and system-based based approach. The CUE TP specifically addresses how cities and urban areas make use of the different kinds of resources that are available within a given urban system. The concept of resources is interpreted in a broad sense and includes everything from material resources (for example, design and technological artefacts, buildings and components, as well as all kinds of artefacts to buildings, all kinds of residual materials or surplus and waste from production); to human resources (for example citizens' engagement and time investment); as well as digital resources (for example open data captured by sensors and visualized in a digital twin using architects' GIS or 3D models).

The main result of the collaboration between Sweco and DUT is the work method, and that the mapping approach generates intelligent dashboard reports which enables it to be a continuous process. The first part of the report presents the methodology for continuous mapping of CUE cases while the second part of the report includes a tentative framework for clustering and future visualization. Recommendations for DUT are also provided, and the report is accompanied by the delivery of the CUE Database and a *User Guide*, available upon request.

1 Introduction

1.1 Background

In spring 2023 Sweco's division of Architects in Sweden was invited to respond to a call for procurement by Formas[1], one of the partners in the EU programme Driving Urban Transition (DUT)[2] and specifically responsible for the Circular Urban Economies Transition Pathway. The call topic was to map 'good examples of circular urban economy in Europe, an exercise that consisted of identifying 50+ cases that could showcase best practice in European cities and towns, hereby reflecting the urgent need to accelerate circular economy, in full alignment with the EU Cities Mission.[3]

Sweco is a leading consultancy in architectural design, engineering, urban planning and sustainable development, with over 22000 employees worldwide and a strong presence on fifteen European markets. The company aims to be climate-positive in 2025 which indicates its ambition, both in terms of its own activities and to support clients in climate transition.[4]

Sweco's bid was accepted on 2023-06-19 and the work that followed has been conducted in close dialogue with Formas and DUT, represented primarily through Björn Wallsten and Ann Maudsley, and carried out in an interdisciplinary and practice-based approach in a team of consultants representing Sweco in Sweden and Belgium. Sweco's team has consisted of a small work group of architects and urban planners, supplemented by a larger team of experts representing a broad field of expertise relating to circular economy. The core team has consisted of: Charlie Gullström, Kathleen Van der Werf, Carlo Negri, Kevin Penalva Harpin, Anders Neregård, Leen Bellens and Emma Sterner Oderstedt. Of the many additional experts who have contributed to the project are the appointed country leaders of Sweco Urban Insight, Sweco's knowledge platform that regularly reports on relevant topics relating to sustainable development.[5]

This report concludes the work conducted by Sweco between July 2023 and May 2024, accompanied by the CUE database, delivered as a separate file and a User Guide.[6] In the following chapters a discription of the work carried out is provided, along with a series of reflections and recommendations to DUT, based on the results of the collaboration.

In practice, the close collaboration that developed between Sweco and the DUT team over almost a year has resulted in an innovative methodological approach, potentially as a way forward for DUT to overview and monitor its own funded projects to generate impact in Europe. As one of several EU instruments to accelerate transition, it is in DUT's interest to closely overview the development of relevant quantitative metrics and indicators to reflect the multidisciplinary and broad field that circular urban economy represents.

1 Formas is a Swedish government research council for sustainable development, see https://formas.se/en/start-page/about-formas.html

2 https://dutpartnership.eu/news/

3 https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/climate-neutral-and-smart-cities_en

4 https://www.swecogroup.com

5 https://www.swecogroup.com/urban-insight/

6 Available upon request. For this and other appendices to the report (a documentation of the evaluation workshops with project leaders who were recently awarded funding through DUT; as well as the Questionnaire which has been used for data collection), please email bjorn.wallsten@formas.se.

A basic foundation for such a work process is, of course, to create a database with sufficient and relevant data to enable analysis and exploration. With this aim, the team decided to ensure a widely spread data collection process, in a way that would make it easy for a wide spectrum of individuals to upload a tentative 'CUE case' and, not least, to inform others who are well placed to propose a CUE case. An online questionnaire was therefore created to enable such a 'crowd-sourcing' approach, using a Microsoft Forms standard template that could be widely spread via DUT's and Sweco's respective websites.[7] Through this user interface and over six months, the CUE Database has been accumulating cases, to date as many as shown in Figure 1, through a co-creation exercise that has involved a large number of individuals across Sweco's and DUT's combined European networks. The map shown is generated from geographical information about the uploaded cases, equally illustrating the advantages of the tool for visualising data through dashboards that the team has chosen.[8] The intention is for the CUE database to continue to thrive with this intelligent data collection to continue to be ongoing throughout 2024, hereby allowing DUT to further explore the benefits of this innovative mapping methodology.

The following sections of text will describe how this work methodology was developed in close dialogue with DUT. Chapters 2 and 3 describe the mapping approach and data collection process, while in Chapter 4 a summary of results is provided along with reflections from two evaluation workshops with project leaders that recently received funding through DUT. Finally, in Chapter 5 a tentative framework is presented for clustering and visualization possibilities for DUT's future foresight.

Figure 1. This dashboard report is generated from Microsoft Power BI and embedded to the DUT and Sweco websites which disseminate the invitation to contribute to the CUE data collection. The map shows the number of cases in the CUE Database and where they are located, based on geographical information input in the CUE Questionnaire. The size of the circle indicates a result of the scoring model (described later in Chapter 2).

7 URL to the CUE Questionnaire: https://forms.office.com/e/aDAy35iqK8 (Sweco 2023), disseminated e.g. via news articles (DUT 2023; Sweco 2023): https://dutpartnership.eu/news/accelerate-europes-urban-transition-share-your-best-example-of-a-circular-urban-economy-case/ and https://www.swecogroup.com/topical/news/driving-urban-transitions/

8 The team opted for Microsoft Power BI platform to facilitate visualization and data analysis through automated reports.

1.2 Understanding Circular Urban Economy

The EU considers circular economy as an important enabler to accelerate climate transition in cities[9] but the circular economy at the urban scale is a complex topic which is not easily defined, and the mapping exercise must be seen in this light. DUT's ambition has been to frame the concept by showcasing best practice examples, for example in view of refining its future calls for research and development; and to inform its foresight development of the CUE Transition Pathway described further below.

For the task at hand, DUT requested experts in several areas relating to circular economy, for example: *recycling, reuse, the sharing economy, renovation and refurbishment, urban agriculture and food systems, urban greening, nature-based solutions, blue-green infrastructure, regenerative urbanism, and waste management.* Besides meeting this demand, Sweco's proposal included a much longer list with experts from a broad range of areas of expertise, based on the team's prior practice-based research and experience from circular city planning and sharing economy at neighbourhood scale.[10] This list included *social sustainability, social inclusion, green and social financing models, cooperative and circular models, stakeholder interaction and transition management, multidimensional framework models for sustainable urban planning, AI, urban and industrial symbiosis, sustainable mobility and cultural heritage values* amongst other topics.

In retrospect, now that a CUE Database is filling with cases from European cities and towns, we can see how this list reflects the many different approaches to circular economy that currently are in development. A benefit of an intelligent data collection process is, indeed, that every new case enriches the meaning of circular urban economy.

While circularity is often interpreted in terms of adaptive reuse of materials; including recycling or upcycling to reduce material flows, the understanding of *circular urban economy* in the DUT context is much broader. It refers to a wide range of resources beyond materials, for example human resources, such as citizens' skills time and engagement or locally produced solar energy, or locally produced urban greens, as well as digital resources, such as captured data about air quality from balconies in the neighbourhood scale. This means that *circular urban economy* should be interpreted with an emphasis on the word economy to include innovative business models, cooperative work models and other ways of organising a sharing of resources so that they can be shared and used among actors in an urban context. From this follows an understanding that *circular urban economy* provides an infinite number of sharing possibilities, and that the concept of waste hardly exists. What becomes

9 https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

10 For example Gullström & Spåre 2022, Gullström et al 2023,2024.
BUUR and Miss Myagi (2023). From vacant to interwoven work locations in Flanders, Belgium. KCVS, VLAIO and VVSG: www.vlaio.be/nl/nieuws/ga-aan-de-slag-met-de-toolbox-verweving-voor-een-bedrijvige-kern
BUUR, Connect & Transform & WES, LABOXX_WERK –Fulfilling conditions for a new urban economy, commissioned by the city of Antwerp, in cooperation with the Flemish government (2016). www.antwerpenmorgen.be/nl/projecten/labo-xx-werk/media

important, however, is a clearly defined system boundary that enables sharing of resources, and to understand at which scale a best-practice case is developed as well as to identify relevant stakeholders can benefit from the value creation at hand.

It may be argued that the most important feature of circular urban economy is its potential urban impact. As a point of departure, Sweco provided an illustration of the many options that circular urban economy entails in terms of system boundaries and value creation at different scale and varying urban context (Figure 2).

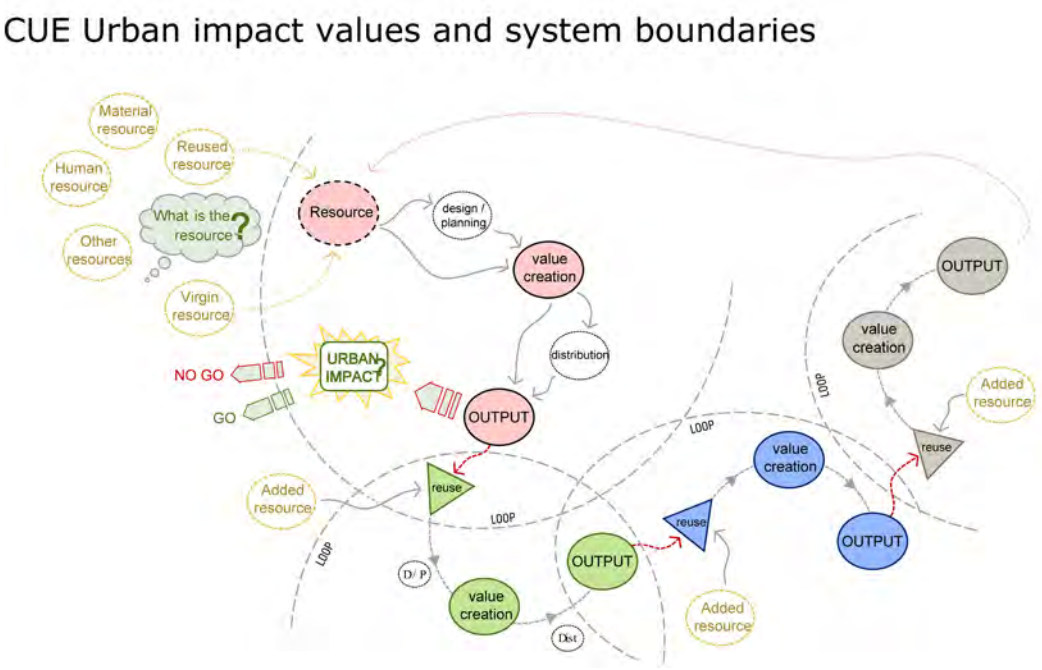


Figure 2. Illustration of circular urban economy as a numberof potential loops at various scales. Sweco.

1.3 The CUE Pathway in the DUT Partnership

The Circular Urban Economies Transition Pathway (CUE TP) is one of DUT's three transition pathways, and the one in which DUT addresses how cities and urban areas make use of the different kinds of resources that are available within a given urban system. The CUE TP understands the concept of resources in a broad sense and includes and includes everything from material resources (for example cultural heritage values, design artefacts or buildings, including all kinds of residual materials and surplus or waste from production); to human resources (for example citizens' engagement and investment in time); and digital resources (for example open data that is accessible in a digital twin).

Circular Urban Economy is a focus area in DUT since cities and urban areas are the drivers of mankind's use of resources, and account for approximately 70-75% of the global use. Given that cities cannot provide these resources themselves, they put environmental pressure on other domains of planetary life, which is why the CUE TP aims to tackle the predominant issues of how cities can reduce their use of resources and become more resource efficient.

The CUE Transition Pathway recognizes that cities are large stocks of buildings, infrastructures, technologies etc., and nexuses of numerous and large flows of materials. From this follows that the CUE TP aims to foster initiatives that prolong the use of resources that have already been utilised through maintenance, renovation and repair activities, but also that linear flows of resources should be changed to closed loop systems to limit virgin resource use and diminish urban waste creation. In both of these respects, cities represent opportunities in terms of density and scale.

While the CUE Transition Pathway acknowledges that technological advances and updated business models are important to achieve increased circularity, it also wants to connect the circular economy to social issues that are pertinent throughout European cities today, such as socio-economic inequalities, issues related to decreased social cohesion and an unequal access to urban resources, services and green areas.

The CUE Transition Pathway further encourages cities to implement circular measures that not only close material loops but provide socio-economic benefits in their urban communities as well. These are self-enforcing schemes that provide more with less.

In this way, the CUE Transition Pathway does not regard circularity as a goal in itself, but as a tool that can be used to achieve improved urban livability and regenerative urban communities and neighborhoods. The CUE TP...

- ...envisions cities and urban areas with restored natural resource cycles that also support a high quality of life to their inhabitants.
- ...wants to create a transformative drive towards healthy, inclusive, attractive and green urban spaces.
- ...supports cities to apply regenerative design principles to create inclusive urban communities that rely on closed material loops to reduce their environmental footprints.

The CUE Transition Pathway captures the circular urban economy by also integrating urban nature and greening, and the promotion of urban biodiversity. Additionally, it emphasizes socio-economic variables such as equitable access to resources, job creation, and economic resilience, as well as socio-cultural aspects like community engagement, cultural preservation, and inclusive urban planning.

Mission

Operating from the assumption that urban areas should be understood and addressed with respect to their resource use and socio-economic preconditions, the CUE Transition Pathway aims to support the plans and design of urban places characterized by regenerative urbanism: by which we mean livable and green communities that are sustained by circular resource flows.

The CUE TP encourages tools and approaches that combine efforts towards increased urban resource efficiency and livability in urban contexts. And by collecting examples and clustering them according to topic and context, CUE TP will provide a portfolio of 50+ solutions that can contribute to the circular transformation of urban areas until the end of the DUT Partnership.
The mapping activity that this report is the end result of and the methodology it presents, is a first stepping stone towards achieving this goal.

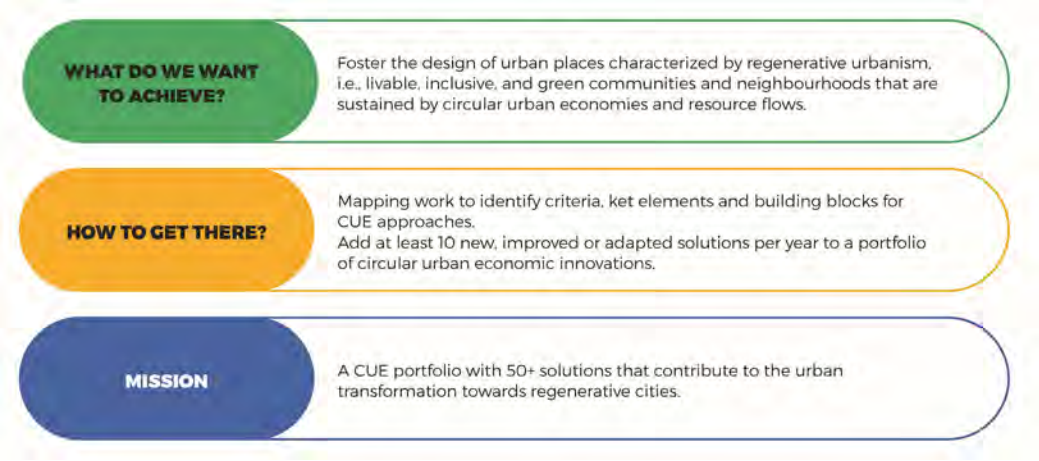


Figure 3. The CUE Transition Pathway in DUT's Mission Statement.

2
Mapping Approach and Methodology

2.1 A Work Method for Intelligent Data Collection

In order to build a database with best practice cases, the purpose of the data collection must be clear. In dialogue with DUT it was agreed that a mapping approach that DUT could continue using once the exercise was completed would be most essential. For this reason Sweco provided a mapping approach that wasn't limited to collecting 50+ cases, but rather a method that DUT could test and refine by providing feedback during the process, and could continue using once Sweco's task was completed. As shown in Figure 4. The possibilities with a steadily growing intelligent database are endless, for example using machine-learning and AI, provided there is valuable data to analyse, of course.

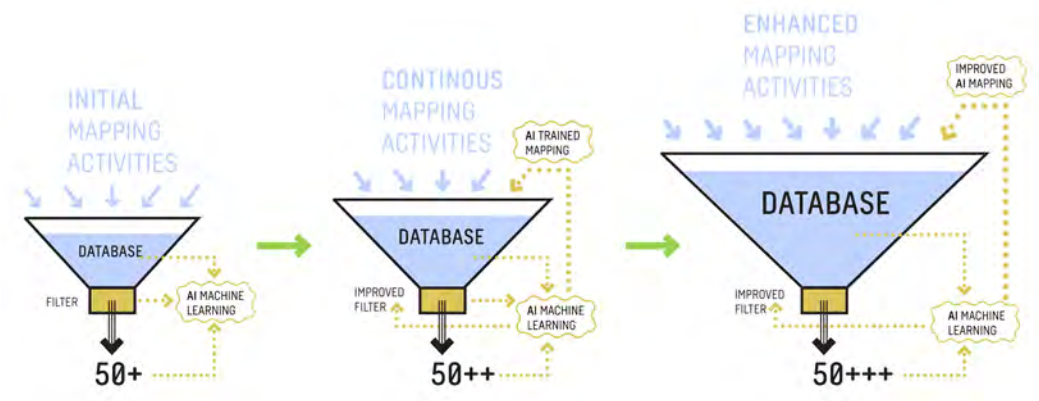


Figure 4. The mapping approach allows for data collection to be continuous and ongoing, refined step-by-step.

2.2 An Online Repository?

The continued dialogue showed that DUT did not yet know precisely how the database would be used following the exercise, however an online repository was a possibility that was discussed, based on examples of best practice repositories that are provided by other initiatives, for example by Ellen McArthur Foundation and EU's Circular Economy Stakeholder Platform.[11] One possibility was a shared repository for all the three DUT pathways.

Regardless of the outcome and usage, DUT appreciated the possibilities that Sweco presented by using PowerBi to visualize various contents as *intelligent reports* that could be generated from the database. It was agreed that a focus of the exercise should be to explore how DUT could make use of such possibilities ahead. The outcome of the exercise would provide valuable input to a later discussion on future possibilities within DUT, given that a database for an online repository requires substantial maintenance from the hosting party, yet to be defined. To inform future foresight within DUT was a key component of the exercise and the subject of the second part of this report, which provides recommendations that may serve DUT in terms of a visualization framework for future development.

11 The EU's Circular Economy Action Plan | European Circular Economy Stakeholder Platform (europa.eu), https://www.ellenmacarthurfoundation.org/circular-design-guide/resources

This intelligent approach directed the subsequent work process and allowed the team to discuss the many possible usages that DUT could undertake with the data, thus illustrating the many different approaches that circular urban economy represents as a subject area. Continued work served to identify an appropriate structure for the database as to enable that all kinds of analysis could be performed on the database, *automatically sorted* with PowerBI. Figure 1 (p.8) provides a basic example drawing on the geographical location of each case in the database. DUT was clearly interested in identifying cases that are currently operative in an urban context, but since the data can be shown in any number of ways, it became important to identify relevant selection criteria to reflect the CUE Transition Pathway, and its potential impact to accelerate transition in Europe. Chapter 2 provides insight into the design of the online questionnaire that followed from this approach.

While DUT originally had been looking for a batch of (approximately 50) *good examples of circular urban economy* that could be showcased as such, the interest increasingly turned to the many possibilities that an intelligent work tool could provide, for example in terms of monitoring and evaluating the impact of what DUT delivers in the context of EU Cities Mission. Could the calls for proposals, for example, be refined to more clearly target specific circularity criteria, thus leading to a stronger DUT CUE portfolio of research and innovation projects? What evolved through the close working collaboration with the DUT team was a step-by-step method toolbox, introducing the team to the possibilities that tools such as PowerBI represents.

2.3 A Work Process in Four Steps

A work process in four overlapping steps developed, the first consisting of defining how to collect cases according to various selection criteria referred to as 'CUE Impact Values'; and secondly how to structure the database to maximize the potential of using PowerBI. As a third step a scoring model was devised in order to classify the data. The fourth step developed a tentative framework based on the CUE Impact Values, as a recommendation for DUT's future work on how to visualize and cluster the cases.

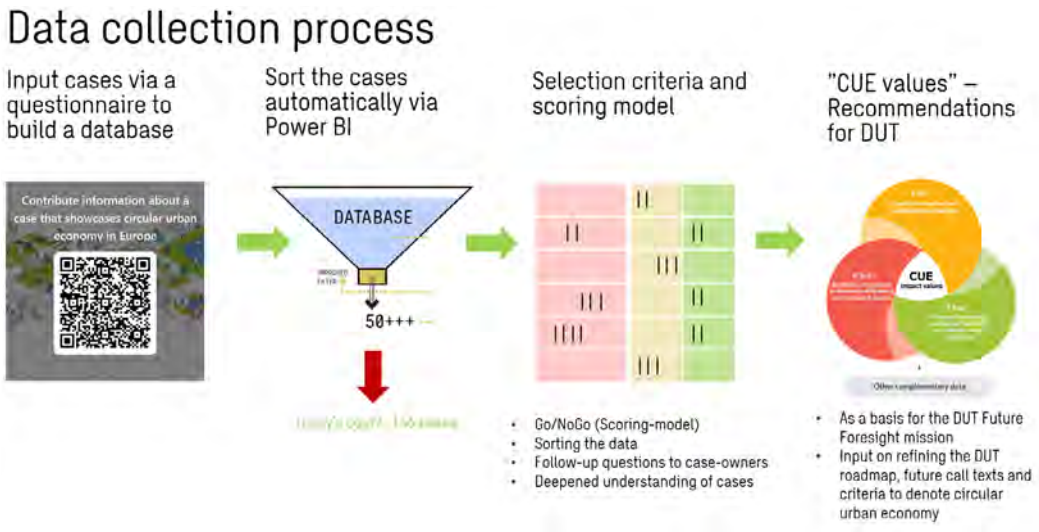


Figure 5. A work process developed in four steps.

During the first two steps, Sweco received feedback from a work session with the DUT 15-minute city mapping team,[12] engaged in a similar mapping exercise, as well as from the DUT Management team and from the DUT work group.

To get feedback on the third and fourth step, Sweco and DUT co-organised a double workshop with the first batch of 12 CUE projects from DUT Call 2022, whose project leaders were invited firstly to an online workshop in March and secondly, to a dedicated session at the DUT Conference in Brussels in April. Summaries of these reflections are supplemented as Appendix 3 and 4 and also referred to in Section 3.6.

2.4 Reaching out To European Cities and Towns

It was agreed that an online questionnaire would be used to facilitate data collection and the first step consisted of organising this. The questionnaire should not take too long to fill in (max 20 minutes) and by spreading its QR-code and URL the intention was to make it easy for anyone to both fill in the form directly online via a mobile phone or computer; or to spread it to others via email and social media (Figure 6).

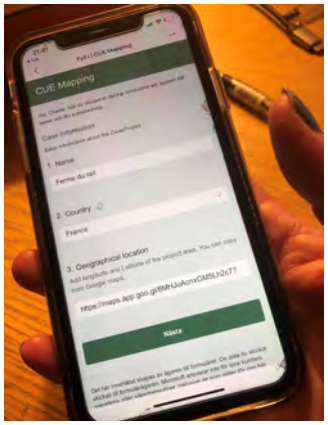


Figure 6. The online questionnaire served easy access and spreading across networks, making it easy to provide basic information about a tentative case also via the mobile phone.

12 https://dutpartnership.eu/wp-content/uploads/2024/04/DUT_15-minute-City-Mapping_04-2024.pdf

It soon became apparent that introductory information on Sweco's and DUT's respective websites would be necessary to spread across the respective networks for anyone to provide basic information about a relevant case.

Figure 7. An info blurb on DUT's website was used to disseminate the online questionnaire to various networks.

To add an incentive and indicate where cases had been collected (and where examples were lacking), an intelligent PowerBI report with geographical data was embedded to the websites.

A contact list for dissemination was created by the work team and data collection was launched by spreading the word and engaging Sweco's network of 30 experts across Europe, and using DUT's networks, as well as other international bodies, universities, and conferences that the team attended across Europe. Notices on LinkedIn have been posted regularly.

3
The CUE Database

3.1 CUE Urban Impact Values – Key Features to Design a CUE Questionnaire

Besides interviews with the DUT team, the written material in the DUT Roadmap for the CUE Transition Pathway was the main source for Sweco's work to extract key features as input to design a questionnaire for the task to generate content for the CUE Database. The following quote extracted from the CUE Roadmap[13] indicates a selection of keywords in bold that were used as key features to design the *CUE Questionnaire:*

- **The built environment as a resource base -** CUE focuses on the resource use of cities and urban areas, recognizing that these are massive repositories of buildings, infrastructures, technologies, and material flows. Therefore, the pathway promotes initiatives that **extend the use of existing resources** through **maintenance, renovation, and repair activities, while also aiming to close linear resource flows to reduce waste.** By encouraging initiatives that prolong the use of these resources, the CUE pathway seeks to **reduce the amount of waste** created by urban areas, while also promoting greater **resource efficiency.**
- **Social cohesion and resource issues in integrated approaches -** But CUE goes beyond just material cycles and recognises the **importance of social issues in achieving a circular economy.** Thus, the pathway encourages cities to **implement circular measures** that also **address socio-economic inequalities, promote social cohesion, and improve access to urban resources, services, and green areas.** In addition, we view urban areas with a great potential of **new principles of urban design** that put regeneration in its focus.
- **Circularity as a toolbox for the urban resource transition -** Overall, we do not see circularity as an end goal but rather as a tool for **creating healthier, more inclusive, and regenerative urban communities that rely on closed material loops** to reduce their environmental footprints. It envisions cities and urban areas with **restored natural resource cycles** that support a high quality of life for their inhabitants, creating a transformative drive towards **healthy, attractive, and green urban spaces.**
- **Towards Regenerative Urbanism -** The pathway envisions cities and urban areas with restored natural resource cycles that support a high quality of life for their inhabitants. By applying **regenerative design principles to create inclusive urban communities, the CUE pathway seeks to create healthy, attractive, and green urban spaces that are both inclusive and sustainable.**

The integrated system-based approach can clearly be noted from the extract, as well as its interdisciplinary approach which includes design practices as well as health perspectives, hereby distinguishing DUT from several other EU-programmes. This exercise led the team to refer to the key features as *CUE Urban Impact Values*, given that the impact from DUT and its capacity as a

13 https://dutpartnership.eu/wp-content/uploads/2022/09/DUT-Roadmap-2022-komprimiert.pdf

programme to accelerate transition, should be possible to define in similar terms. The questionnaire that was designed can be seen as a first step in this direction, providing a method toolbox for further development of quantitative measures and indicators that reflect the DUT CUE Pathway.

This online questionnaire was intended as the main user interface of the CUE database and to enable easy access for users and also facilitate export to PowerBI and equivalent platforms, a standard template from Microsoft Forms was chosen.

The final questionnaire is available online in several languages, and consists of 38 questions,[14] of which very few are compulsory (for example to indicate the geographical location, based on the idea that a European map of CUE cases, would be useful), to enable quick input from people that are mobile or travelling. The first questions are illustrated as Figure 8 below.

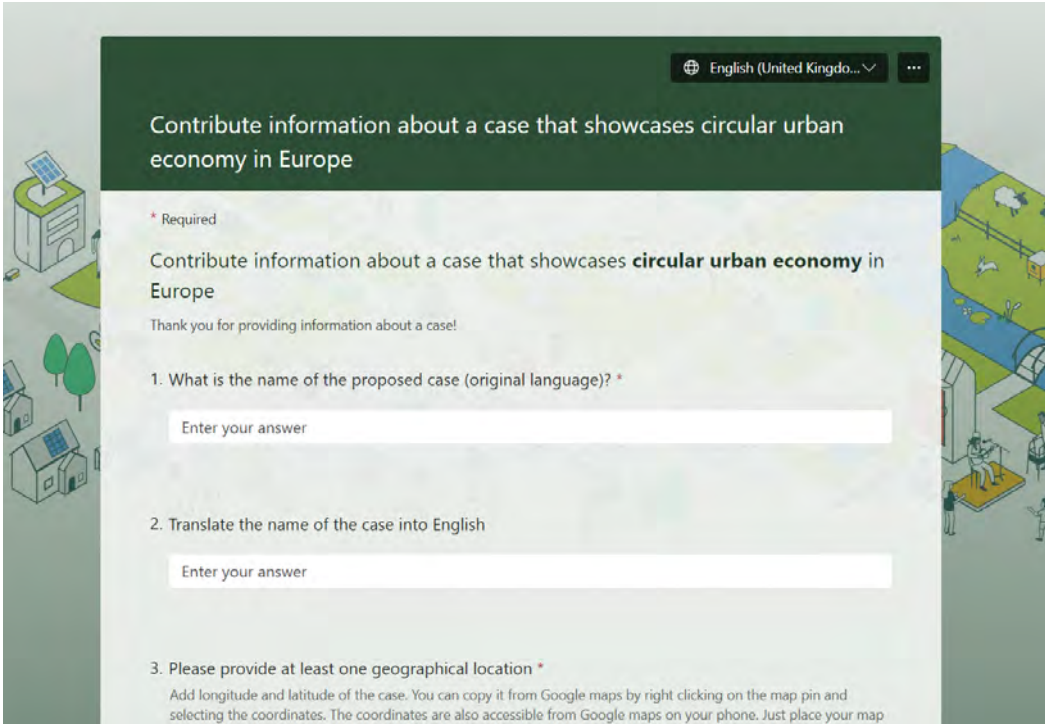


Figure 8. Key features were extracted from the CUE Transition Pathway to design the CUE Questionnaire.

14 Available here throughout 2024: https://forms.office.com/e/aDAy35iqK8

3.2 Go or No Go – What's Circular Enough?

During the first steps of the work process, the team planned to set constraints in order to exclude certain proposed cases that would not be 'sufficiently circular' according to the CUE Impact Values, as defined above. To identify which selection criteria that would favour certain cases to score above a 'Go / No Go' level was thus an important part of the work process. Figure 9 illustrates an early work model that reflects this approach that would give the possibilities for deep-dives and follow-up of cases that met the main selection criteria at a later stage, labelled *secondary and tertiary* levels of data collection. Following the development of the work as described in Chapter 1, this approach was abandoned in favour of a more open-minded model that would allow most cases to remain in the database, given that DUT might be interested in listing cases although these might not meet all the selection criteria.

Figure 9. Initial work model to design the questionnaire and scoring model.

3.3 Developing a Scoring Model

The above process nevertheless shows the importance of a scoring model that makes it easy to analyse the data from the different approaches that the CUE Impact Values represent and, of course, also making it possible to study how the cases perform according to every question in the questionnaire. A first draft of the scoring model was made in October 2023 and provided cases to reach a maximum of 120 points. However, in alignment with the preparation for the PowerBI set up, it was later adapted and the final version enables a maximum of 85 points. Figure 9 shows the final scoring model which has two so-called 'killer questions' that place a case on the bottom of the list, each awarding a negative score of minus 10 points. The reasoning is that the questions: *What kind of urban system relates to the case?* And: *Is data available?* each respectively are seen as crucial for the selection of cases at hand. Only if a case responds *rural* (and not *urban* or *urban and rural*) on the first, it will receive -10 points. The same occurs if a case responds that *no data is available*, for the reason that it has been considered fruitless to develop a database of cases that will not generate any kind of data during the process of their lifetime.

Highlighted in Figure 10. can also be seen batches of questions that have been grouped according to how well they respond to topics in the CUE Impact Values, here labelled as *Resources* (grouping 7 questions with a maximum of 32 points); *Social and Greening* (each with 3 questions provide a maximum of 12 points); and finally *Data,* with one question giving as much as 8 points, based on the multiple answers relating to available domain data.

Finally, certain questions reveal other thematics of relevance to CUE Impact Values, such as:

- *Which urban system(s) apply to the case? Several options possible* (0-5 points)
- *Which sustainability dimensions is/are primarily addressed in the case?* (0-3 points)
- *What are the key challenges for the case to achieve circular urban economy? Several options possible* (0-8 points)
- *To which degree does the case promote gender equality and inclusion, according to you?* (0-4 points)

The last of the questions illustrates a section in the questionnaire which at first glance appears as very subjective, given that a range between 1 and 10 is available. The scoring model however translated this this to grades 1-4 points. Generally, if a response was lacking, the grade 0 was generated.

It is important to emphasize that the scoring model is indicative and serves as a method toolbox for DUT. The cases that are submitted to the database are not subject to any evaluation as such.

Scoring model for CUE mapping (Min -20pts Max 85pts)

14 "qualifier" questions (CUE urban impact values)	Other Questions Max 29pts	If several stakeholders are involved, please specify the type of organisations (several options are possible)	0-5	
		What kind of urban context applies to the case?	-10, 0	"NoGo" Killer question
		Which urban system(s) apply to the case? Several options possible	0-5	
		What is the nature of the value creation of the case?	0-4	
		Which sustainability dimension(s) is/are primarily addressed in the case?	0-3	
		What are the key challenges for the case to achieve circular urban economy?	0-8	
		To which degree does the case promote gender equality and inclusion, according to you?	0-4	
	Recources Max 32 pts	Does the case make use of existing resources for its value creation?	0-1	
		Does the case close linear resource flows?	0-1	
		Which key resources does the case depend on?	0-3	
		Does the case prolong the use of existing resources?	0-1	
		To which degree does the case reduce waste according to you? Please grade from 1 to 10	0-4	
		To which degree does the case involve reuse, renovation and/or repair of resources, according to you?	0-10	
		To which degree does the case improve access to urban resources, according to you?	0-4	
	Social Max 12 pts	To which degree does the case address socio-economic inequalities, according to you?	0-4	
		To which degree does the case promote social cohesion, according to you?	0-4	
		To which degree does the case promote health and wellbeing, according to you?	0-4	
	Green Max 12 pts	To which degree does the case improve access to public space, according to you?	0-4	
		To which degree does the case improve access to green areas, according to you?	0-4	
		To which degree is the case a result of regenerative design principles, according to you?	0-4	
	Data Max 8 pts	Please specify available domain data relating to the case	0-8	
		DataAvailable	-10, 0	"NoGo" Killer question
		DataAvailable	Year	

Figure 10. The scoring model which generates a minimum of -20 and a maximum of 85 points to a case.

3.4 An Example From the CUE Database: La Ferme du Rail, Paris

Situated in the dense urban fabric of the Parisian *19ème arrondissement,* on rue de l'Ourcq, the urban farm and green oasis La Ferme du Rail (Figure 11), provides an excellent example of the many possible approaches of circular urban economy that the CUE database comprises. The case is the result of a call for procurement for urban development, initiated by the City of Paris in 2014, under the label *Inventer Paris,* explicitly seeking novel approaches to circularity and social sustainability in the urban setting, which was won by a multi-disciplinary project team headed by the architect Clara Simay.[15] Greening the city, in French *verdissement,* in order to strengthen bio-diversity is one of features of the ongoing climate transition in Paris, led by its Mayor Annie Hidalgo, since several years. Its ambition to generate a healthy city also includes measures that prompts walkability and cyclability, and novel approaches that stimulates social inclusion and accessibility to urban public space. All these conditions are met by this example. Developed over the course of four years, this unique city block of merely 1800sqm creates an oasis of circular urban economy comprising:

- Housing: one building has 15 flats for homeless and 5 for students, with time-limited contracts (Figure 12).
- Urban food production with workshops and a greenhouse includes aquaponic farming of urban greens as well as mushroom production and an exterior permaculture farm (Figure 11).
- A zero waste restaurant makes use of the farm's produce as well as food waste from neighbouring supermarkets (Figure 14).
- A pedestrian passageway that hosts the neighbourhood recycling centre guides citizens and visitors to an upper-level disused railway, which faces the restaurant terrace (Figure 13).

Figure 11. La Ferme du Rail is a small circular urban economy city block in the centre of Paris. The plan indicates the mixed programme fits into merely 1800 sqm. Image: Clara Simay Architect

Figure 12. When Sweco visited the block, neighbours came to collect their weekly urban greens, and it could be assumed several had participated in some way to the activities in the farm. Photo C. Gullström.

15 https://www.fermedurail.org/

Figure 13. To the left, the greenhouse building with workshops. The building to the right contains 15 flats for homeless and 5 for students. Photo C. Gullström.

Figure 14. The restaurant is located underneath the greenhouse and with an outdoor terrace facing the disused railway that now functions as a pedestrian pathway. Photo C. Gullström.

All buildings are constructions from 100% material reuse and include several innovative technologies, for example relating to insulation, water and energy infrastructure, linked to the team's strong ambitions and its associated network of entrepreneurs representing a quadruple helix research and innovation consortium. The students and homeless who live in the block are invited to work in the farm and to collect food waste from the participating supermarkets in the area.

This example is representative of circular urban economy in various ways. In one way it creates a value chain that combines commercial activities (the restaurant) with social and cooperative initiatives that benefit those who live there. The restaurant makes use of surplus food and food waste from neighbouring shops and as customers we will use money to pay, while others who have contributed their own time and labour will not. In addition, the buildings have been constructed with reused materials and the permaculture approach will ensures that water and sewage maintains a balanced ecosystem. This, in turn, can be described as a value creation process that strengthens biodiversity which, in combination with the quality of the design and planning will nudge people to walking through the block, thus fostering health and wellbeing.

What this also shows is that a circular economy case could be added to the CUE Database from different initiating bodies. The Ferme du Rail could, for example be listed as a municipal initiative, stressing an innovative form of engagement with external stakeholders in reaching the city goals. It could also be listed as a multistakeholder research and innovation project with several forms of funding, or then again as an architectural design project. What is clear, however is that it is a project in an operative phase, which was sought for by DUT.

Following the scoring model that has been developed, this case scores 61 points out of maximum 85, which places it in the top 20 of the batch of 151 cases, at the time of this report. As can be seen in the report below (Figure 15), it scores well in terms of making use of several resources, social sustainability, planning

and design. It could most likely also score high in terms of available domain data in 2024, however, we have not been able to secure what kind of data that the project monitors regularly.

Finally, it should be stressed that the case is operative, which meets an important objective in the mapping approach, given that DUT is looking for cases that showcase circular urban economy in action. As we will see in the results section 4.1, La Ferme du Rail is among the top ten highest scoring cases that are in operative phase (see Figure 21.)

Figure 15. PowerBI report highlighting La Ferme du Rail.

3.5 Generating Reports With PowerBI

There are endless ways to visualize data and, as already mentioned, the team opted for Microsoft PowerBI to facilitate accessibility and export to other platforms. What was important was to indicate the possible ways in which DUT could make use of such a work methodology in its daily practice, and perhaps also share with other EU programmes. A User Guide therefore accompanies the CUE Database that Sweco hands over to DUT as a method toolbox with recommendations for further development and implementation.

Using Power BI dashboards to present questionnaire data offers significant benefits. These dashboards enhance data visualisation through interactive charts and graphs, making complex information easy to understand and quick to analyse. They provide real-time data updates, crucial for informed decsion-making. Additionally, Power BI supports detailed data exploration with its drill-down capabilities, allowing for in-depth analysis of various project aspects. The dashboards are also easily shareable across teams, facilitating better collaboration and communication.

In this section we want to highlight some of the possibilities that PowerBI offers to generate reports based on the CUE Database. Figure 16 shows the status of the CUE Database at the time of writing this report. It illustrates a dashboard we created using the coordinates provided in the questionnaire that place each of the different cases on the map of Europe. In the table on the left, we have listed all the projects in the CUE Database along with their ratings and related web pages. We distinguished the recently funded DUT projects from the others by using a yellow colour, since this group of project leaders constitutes a focus group that as part of an evaluation exercise that was conducted (see section 3.6 below). This kind of work tool makes it possible for DUT, as an EU partnership program to more closely follow these cases in closer detail over the development of their projects. It can be argued that, as part of future development, certain indicators or metrics might be considered valuable and could be reported by projects that receive EU-funding to accelerate transition, in which case such dashboard reports could prove very useful. In this case, it might also be possible for DUT to integrate certain metrics already as part of the application procedure, making it clear that projects need to monitor certain features of circular urban economy throughout the progress of their projects.

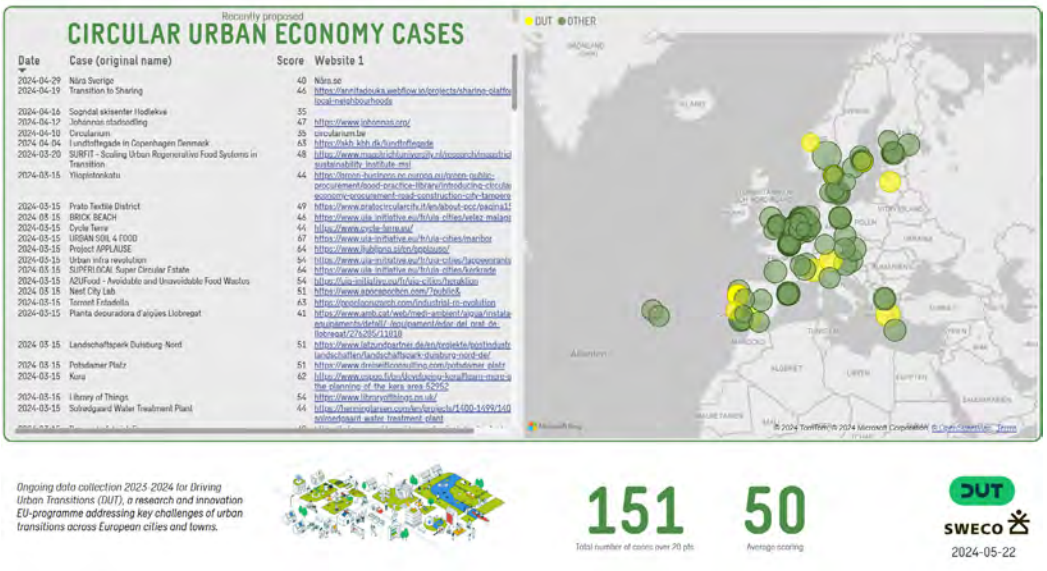


Figure 16. An intelligent dashboard report from PowerBI with geographical locations and the list of recently proposed cases, and those contributed by DUT-projects marked in yellow.

Another example of a dashboard report that was generated relates to social sustainability, social cohesion, health and wellbeing as seen in Figure 17. This dashboard is created by linking three questions in the questionnaire that address these related topics, as previously indicated in section 3.3. From this we can distinguish as many as 48 out of 151 'top scoring' cases, thus representing more than 30% in the overall database. In this respect, it is noteworthy that 25% of the batch merely scored 6 points or less in response to these questions.

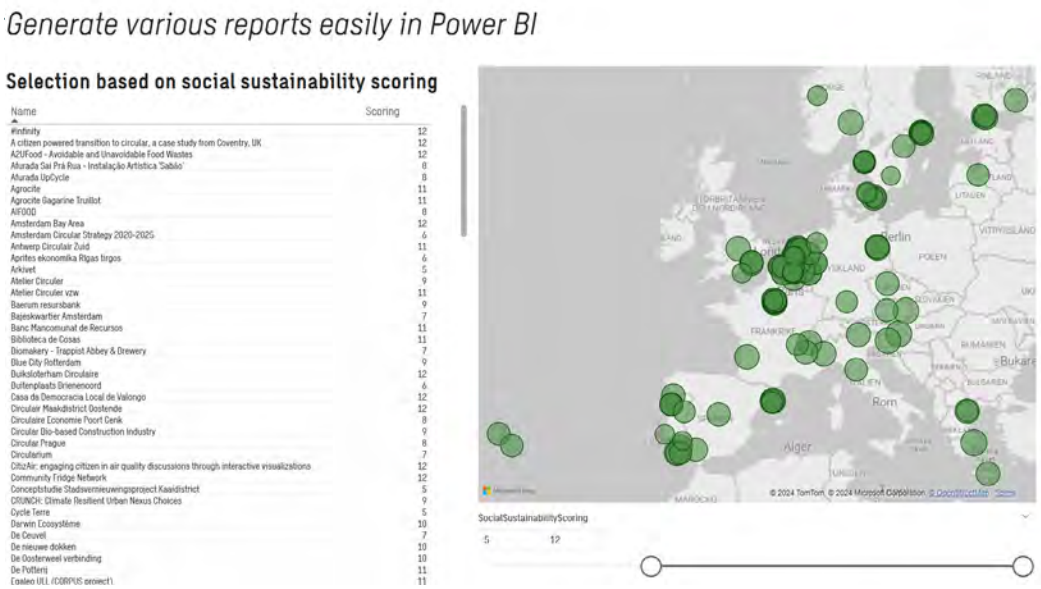


Figure 17. A dashboard report that lists cases that score high on social sustainability.

A third example is a dashboard that indicates available domain data (Figure 18) is possibly one of the more important sources for follow-up and deep dives into the CUE Database, should DUT wish follow certain cases over their lifetime or make use of the dashboard as a tool to decide on which cases to select to the CUE Innovation Portfolio. That cases (and especially research and innovation projects funded by DUT) generate data is crucial to make a database valuable. Chapter 4 presents some of the many possibilities for DUT to explore relevant metrics through dashboards that, for example, visualize the impact from DUT's own calls to accelerate the transition to circular urban economy.

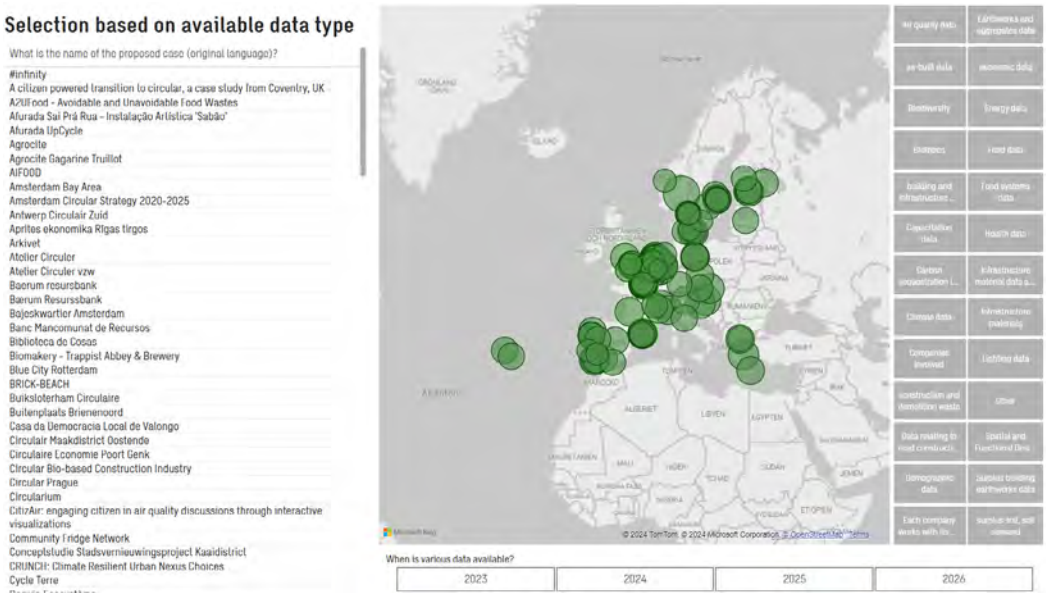


Figure 18. An example of a dashboard report that indicates available data types.

3.6 Evaluation and Feedback From Workshops

As mentioned in Chapter 1, the first steps of the work process included a series of interactions with the DUT work group and management team, as well as with the parallel sister project DUT's *15-minute city mapping exercise*[16], with feedback and a continued dialogue that has substantially informed the work process. Valuable feedback was again provided on various other occasions when Sweco presented work-in-progress. Early on, it was agreed that the DUT Conference in Brussels in April 2024[17], would provide an opportunity to evaluate the work so far, together with the 12 project leaders that were awarded funding from the DUT CUE call for proposals in 2022.[18] For this reason a two-step workshop was organised with the project leaders. First a two hour long introductory workshop, online, in March during which the mapping approach was discussed alongside presentations with the twelve project leaders from the the first DUT batch of funded CUE projects. The agenda focused on presentations and identifying the circular approaches of the projects and their possible synergies. This was followed by a half day workshop in Brussels on 12 April, hosted by the core work team, in which a total number of 23 participants from the CUE projects were involved (see Figure 19).

The focus of the second workshop was to evaluate and provide feedback on the mapping approach and the tentative visualization framework (presented in Chapter 3). In the following we highlight some of the feedback provided as part of the workshops with the DUT Project leaders.[19]

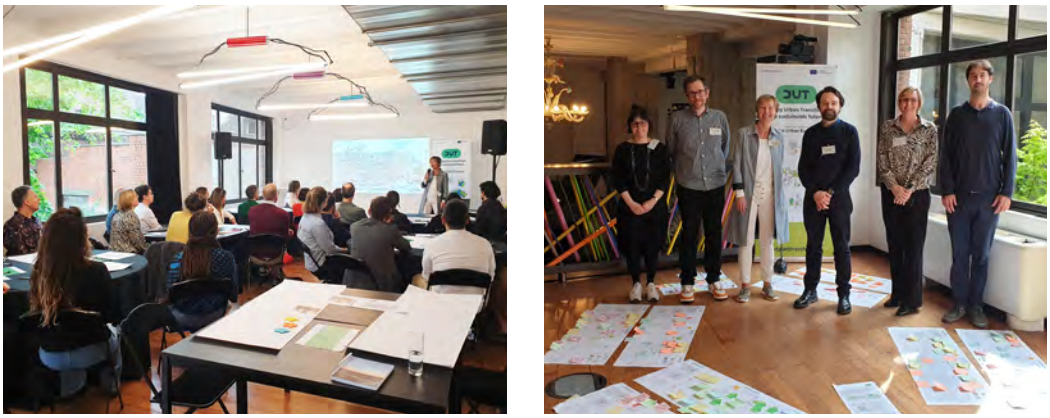


Figure 19. To the left, the workshop participants are introduced to the evaluation exercise, to the right, the core work team stand by the evaluation results produced by the five tables (from left to right: Ann Maudsley, Björn Wallsten, Charlie Gullström, Carlo Negri, Kathleen Van de Werf, Kevin Penalva Halpin).

Feedback on the Questionnaire and Database

Most participants were acquainted with the CUE Questionnaire since they had been requested to submit information about the projects they were about to launch. They were open-minded and appeared interested in the way the

16 A report by DUT 2024.

17 https://dutpartnership.eu/dut-events/dut-conference-2024/

18 https://dutpartnership.eu/funding-opportunities/dut_call_2023/

19 A summary is provided in Appendix 3, available upon request.

mapping approach identified links and synergies between projects. Several comments related to the potential of cross-fertilization between projects and a discussion emerged on the possibility for a follow-up of the data at a later stage, when the DUT-projects would have progressed. It was our understanding that project leaders were willing to be part of a continued evaluation and progress of the projects, but they were wondering how such a monitoring would develop, for example as expressed here:

> **How will post-completion / implementation / evaluation of projects be enabled?**

We also received feedback on how representative a database will be, when it is based on a collaborative 'crowd-sourcing' approach for data collection, for example:

> **We easily find cases in some countries (NL, S have much more cases) whereas other countries (FR) maybe we can ask why?**

Feedback on Visualization and Engagement

We have grouped these questions as we reflect that project leaders are curious about DUT's initiative to involve them in a process which relates to progress, outcome and expected impact. For several, this is an innovative approach in research and innovation but it nevertheless appears to inspire interest in net-working and collaboration. We noted that the methodological approach evoked interest as such and that an overview and monitoring of best practice examples could be fruitful. Some examples:

- **The framework is useful as it acts as a dialogue model**
- **The visualizations are inspiring and clarifying**
- **An online dashboard based on this framework would be very useful**
- **Include the terms NBS and sharing economy in a more explicit way**
- **Include the dimensions of policy, decision-making and law/regulation as criteria**
- **More on the sharing economy would be useful**
- **A holistic overview of examples would be appreciated**

Feedback Relating to DUT Research Themes

During the evaluation we were made aware that the topics of the DUT 2022 call text[20] were quite prominent and had directed how applicants decided to inter-pret the CUE Transition Pathway in their applications for funding. This meant that our emphasis and extraction of CUE Urban Impact Value perhaps, to an extent, surprised them. In fact, several had difficulties in defining the 'circular urban economy' dimension of their projects, which we believe relates to this. They believed they had applied for funding for an 'urban food system' and the circularity part was secondary. We see this as an important consideration and potential for the future development work of the toolbox in relation to preparing DUT's calls for proposals. Here are some quotes from the workshop that confirms the diversity of the field of circular urban economy:

20 https://dutpartnership.eu/funding-opportunities/dut_call_2022/

Encourage interdisciplinary research

Valuable knowledge dissemination (during + post research stages)

One problem is the definition of the concept of urban circular food economy. Food is by nature produced in the rural area and hence there is a missing link … urban and rural economy. The transition of a circular food economy needs to incorporate the production of food. This includes the socio-economic inequities in the rural economy

General questionnaire for variety of topics within the CUE pathway
– specific info for each of the 3 topics

Perhaps break down /categorise the projects into categories of the CUE-call:
Nature-based solutions, urban food systems…..(?)

Kind of solutions, e.g. NBS [Nature-based solutions]

How 'circularity' and 'resources' are defined in different context is quite diverse, so how to collect opinions on the same page might be quite challenging and should be sensitive

Feedback Relating To Formal Issues Such as GDPR, IPR and Data-Related

We received feedback of the kind that DUT needs to prepare for: who is responsible for the database and for the data it contains? This also regards maintenance of data. It is an important topic which relates to the potential idea of an online repository and addresses several issues that need to be considered ahead:

What sort of data sharing agreements are in place?

More transparency relating to hosting and storage of data

Is it stored by Sweco, as a private company?

Is it public and available (open access)?

Timeline of storage (forever?) linked to maintenance

Feedback Relating to How We Can Spread Further

We received relevant feedback on the collaborative approach to gather input from various sources across Europe. There is obvious room for improvement here, should DUT undertake the task to build a repository, for example.
The feedback indicates that DUT project leaders, who could be considered a significant target group, have not been aware of the broad invitation that had been spread to contribute cases for the mapping exercise, using various communication networks including social media:

Get wider participation by a call on social media/website

Checking complementarities?

How local / non-replicable are the solutions? I guess I miss an
overarching way of understanding the impact of industrial solutions overall

4
Results

4.1 A Work Method That Generates Intelligent Reports

The main result of the collaboration between Sweco and DUT is the work method that the mapping approach enables as a continuous process that generates intelligent dashboard reports. Numerous kinds of reports are possible and further development work is needed by DUT to define which the needs might be. In the following sections we illustrate some of the possibilities that were explored in the process. The method toolbox allows DUT to operatively experiment with PowerBI as part of its future foresight and preparation for calls for proposals for research and innovation.

Firstly, we provide some key figures regarding the outcome, the *CUE Database*. At the time of writing, the CUE database counts 165 cases, as seen already in Figure 1. However, it should be noted that along the way, a process of refinement and clean-up of data was carried out which was deemed necessary, in some cases because the geographical location has been faulty, in others because the listed website was incomplete. The team has continuously performed a certain amount of revision to the database.[21] Subsequently, in concluding this work, we decided to instruct PowerBI to exclude cases with 20 or less than 20 points, given that these cannot be considered to sufficiently meet the key selection criteria that represent CUE Urban Impact Values. This leaves us, at the time of writing, with 151 cases. This current basis for evaluation of the *CUE Database* is illustrated in Figure 16 which also distinguishes (in yellow) the batch of 17 'DUT-funded projects' of the focus group, already mentioned, that has been part of an evaluation exercise.

In total, the cases represent 16 European Union countries and the UK, which shows that not all 27 European countries are represented in the *CUE Database*. The cases are also unevenly distributed in Europe. This can be explained by limitations and bias in the data collection process, which has centred on networks in northern and central Europe.

Given the agreement to let the data collection be ongoing and continue during 2024, via the same user interface, it is our expectation and hope that further additions will continue to enrich the CUE database, hereby informing the EU programme also in term of the qualitative approaches that for example.... and, most importantly, contributing to accelerate the transition to circular urban economy in European cities and towns.

21 Appendix 1 User Guide provides suggestions on the kind of refinement and clean-up of data that is typically needed when an online, publicly available, user interface is a basis to generate PowerBI reports.

4.2 Targeting Cases in Operative Phase

As has been mentioned, the data can be sorted in multiple ways, however, to showcase *ongoing cases in European cities* was a major objective for DUT. The illustration below (Figure 19) is a dashboard report indicating that 64 of 146 cases are ongoing and listed as in 'operative phase'. This report will automatically be updated, should further cases be upload to the database. As a consequence, DUT will be able to monitor its operations regularly using PowerBI.

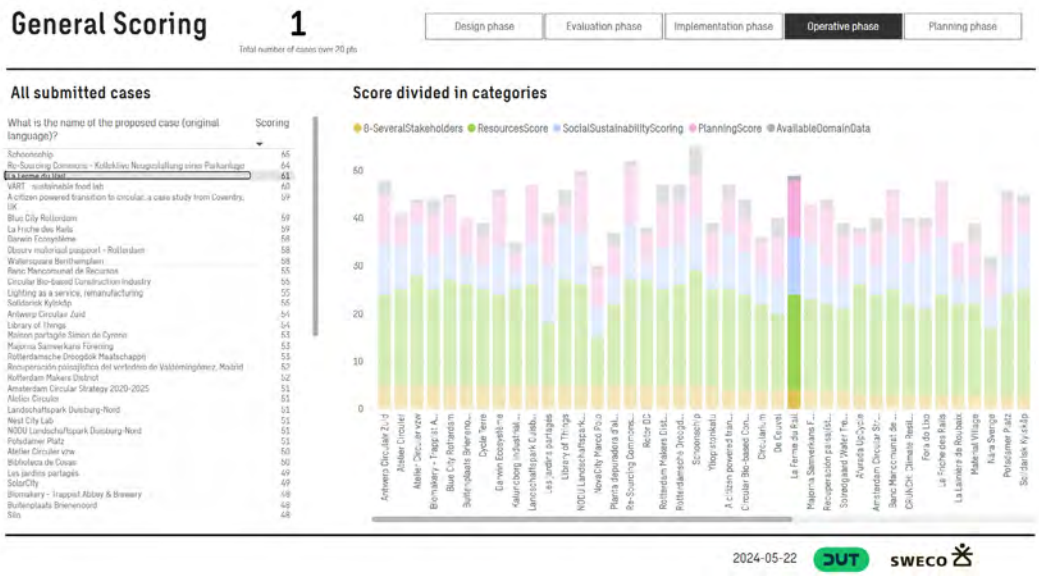


Figure 20. Dashboard report of cases that are listed in operative phase.

An additional dashboard report that might be valuable is to combine the listed operational cases with those that score the highest. Below, in Figure 20. we see the 'top ten' cases in the CUE Database, in terms of those that are operational and score most points.

Top 10 cases in operative phase

Name of the case	Scoring
Schoonschip	65
Re-Sourcing Commons - Kollektive Neugestaltung einer Parkanlage	64
La Ferme du Rail	61
VÄRT - sustainable food lab	60
A citizen powered transition to circular, a case study from Coventry, UK	59
Blue City Rotterdam	59
La Friche des Rails	59
Darwin Ecosystème	58
Obsurv materiaal paspoort - Rotterdam	58
Watersquare Benthemplein	58

Figure 21. Dashboard report of the high-scoring top ten cases in operative phase.

4.3 Targeting Cases That List Human Resources as a Key Contribution

It has been argued in the introduction to this report that measures for circular urban economy should account for a broader range of resources, beyond 'material reuse'. An important result of the report is in fact that the persons who submitted information about cases were able to respond in relation to the multiple dimensions of circular urban economy that the *CUE Questionnaire* addressed, as illustrated by the charts in Figure 21.

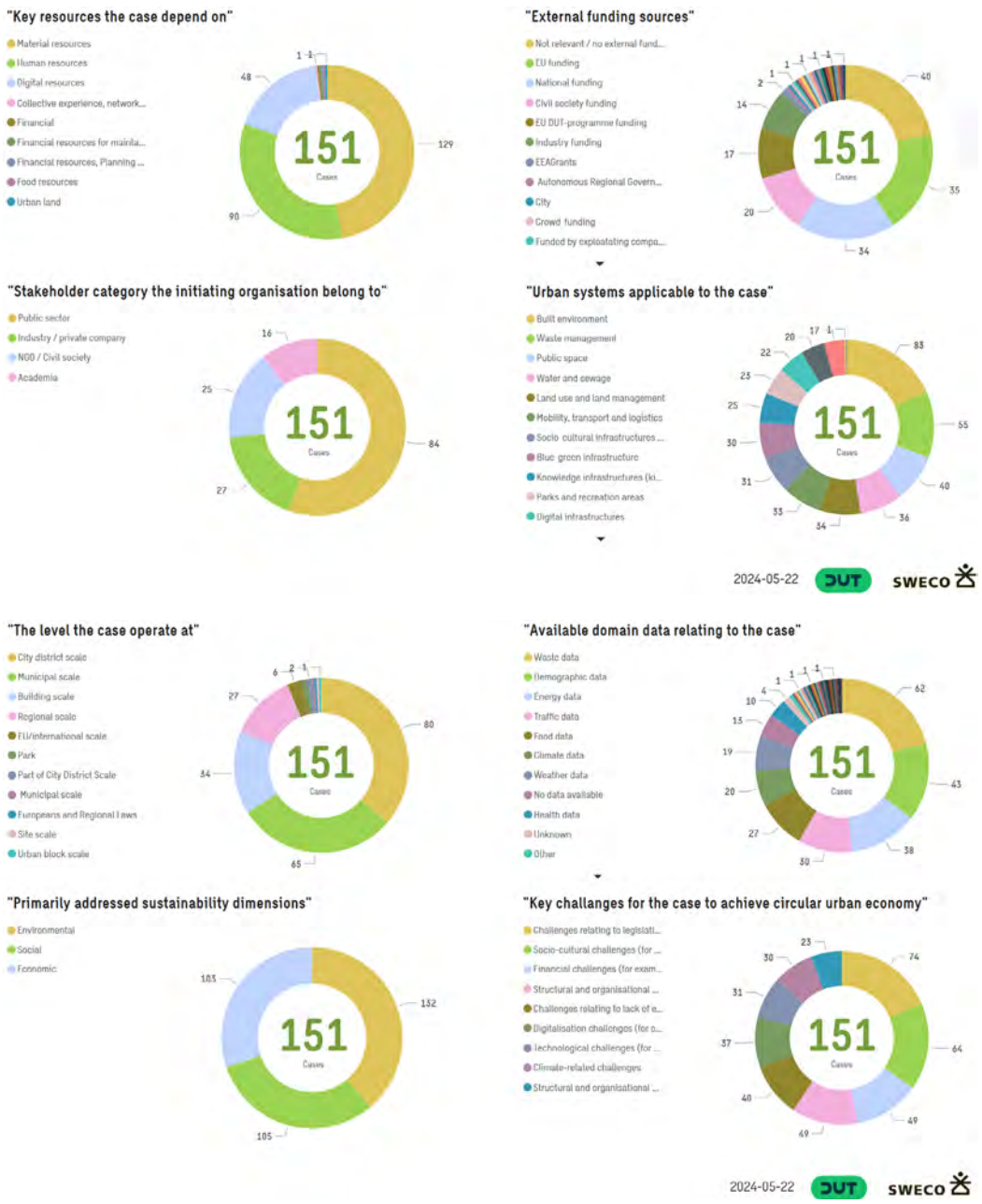


Figure 22. Dashboard reports presented as charts reflecting responses to the questions in the *CUE Questionnaire that address CUE Urban Impact Values.*

One of the most significant factors relates to the engagement from citizens as contributors and initiators of novel practices, which can be recognized in different values, such as effort, invested time or skills presented. Here, we have used the term *human resource* as a key factor and, as shown below in Figure 22, we have explored how the batch of recently funded DUT-projects score in comparison with the cases in the overall *CUE database*. It is notable that 94% of the cases in the DUT batch of recently funded projects list 'human resources', in comparison with 60% of the overall database with 151 cases. The outcome clearly indicates that efforts from citizen engagement through innovative, social and cooperative, so-called *grassroot initiatives,* also are valued as resources in sharing economy and circular economy.

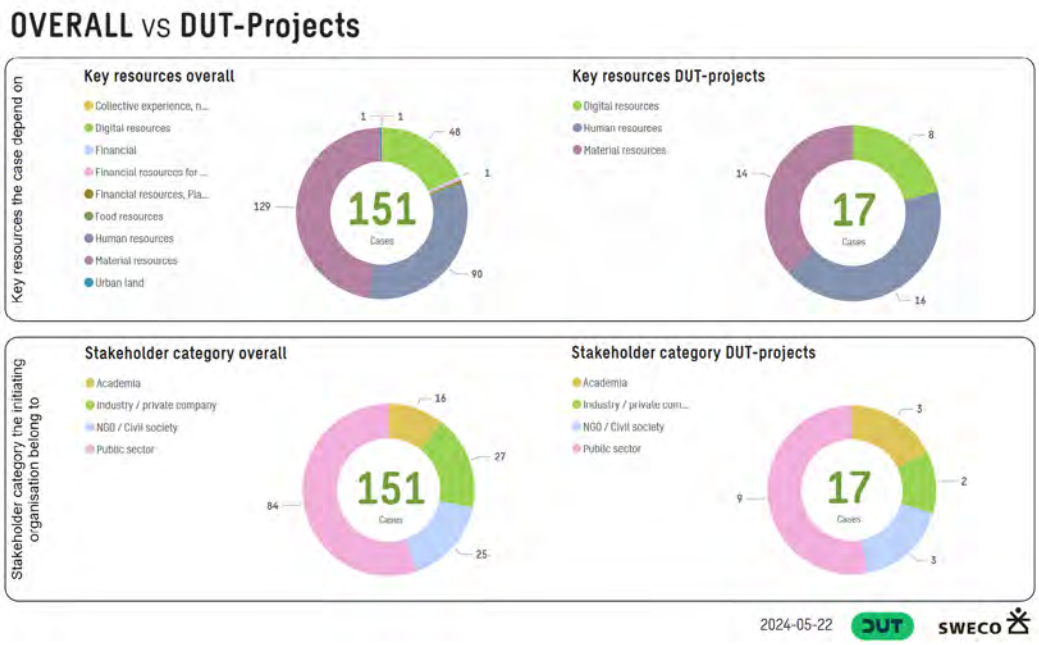


Figure 23. Dashboard reports show that the DUT batch of 2022 scored high both in terms of listing 'human resources' and 'NGOs/Civil society' stakeholders.

4.4 Targeting Cases Initiated by Grassroots and NGOs

The role that grassroots and NGOs play in accelerating the transition to circular economy is of interest and reflects many innovative approaches in the *CUE Database*. Figure 22 illustrates that NGO's are well represented in the funded DUT projects, 20% as 'initiating organisations' and 60% as 'other stakeholders'. This should be compared with what we have concluded regarding the overall batch of 151 cases, where only 12% participated as 'stakeholders'. These are two separate questions in the CUE Questionnaire and in terms of the 'initiating organisation' the figures are however more similar: 17% in comparison with 20% for the whole database.

It is, of course, possible to cross-examine the cases that score high on a category such as 'NGOs an initiating organisation' by checking if they count among the overall top-scorers in the CUE Database. Below in Figure 24 we provide a list of the 17% 'NGOs as initiating organisation' - that also score a minimum of 50 points, to illustrate this possibility. Again, it should be emphasized that this is an example of a report that can be generated automatically, prompted when needed by DUT.

Figure 24 Dashboard report showing the top scoring cases in the CUE Database, which also list NGO as an initiating organisation.

4.5 Targeting Cases That Score High on Data Availability

Data availability from different domains is an important indicator, should a repository be created by DUT, not least given the potential to monitor certain metrics from projects to which DUT contributes funding. In this exercise, there is a lack of information about the kind of data that the cases generate on a regular basis. In order to illustrate the kind of impact report that this could generate, we use the question relating to available domain data, with the awareness that several data sources will be needed to enrich an online repository. We conclude that the need for such quantitative measures can be introduced already in the DUT call text, thereby continuously monitored through PowerBi (e.g. CO2 equivalents, kWh, increased biodiversity, hours spent, reduced food waste, number of initiatives etc) during the development and expected operative phase of EU DUT-funded projects.

To further emphasize the potential of using PowerBI as a monitoring tool, we have created a dashboard based on the above and matched it with the top scoring cases in the CUE Database. The result, presented in Figure 25, shows the cases that both score high in terms of available domain data and overall (a minimum total score of 50p).

It is, of course, important to stress that a deep dive follow up with the cases would be necessary to identify the potential relevant metrics for each project. It is nevertheless an important learning outcome of the collaboration that DUT might want to consider such monitoring of data and metrics throughout the project development. An online portal/interface would make it possible for DUT projects to contribute to the CUE Database, in order to generate such dashboards reports as illustrated here.

Top 22 cases, available domaine data

Name of the case	Score, Available Domain Data
AIFOOD	8
Lundtoftegade in Copenhagen Denmark	7
Project APPLAUSE	7
Schoonschip	6
Strategia per l'economia circolare della città e provincia di Bolzano	6
URBAN SOIL 4 FOOD	6
Innovation Integral Park (Integrapark)	5
Agrocite Gagarine Truillot	4
Amsterdam Bay Area	4
Buiksloterham Circulaire	4
Circular Bio-based Construction Industry	4
Circular Prague	4
De Ceuvel	4
De Oosterweel verbinding	4
La Borda	4
Material Village	4
Minimistan	4
Oosterweelverbinding	4
Rotterdam Makers District	4
Super Circular Estate	4
Urban infra revolution	4
Watersquare Benthemplein	4

Figure 25. Dashboard report of cases that score high on available domain data.

4.6 Reflections and Future Recommendations

Based on the practice-based experience and results from the work process and evaluation workshops, the following reflections, summarized as recommendations to serve as proposals for future development work in the DUT Partnership.

Recommendation 1. Take the CUE Database to the next level: a best practice toolkit in circular urban economy through joint efforts and a collaborative 'crowd-sourcing' approach

We recommend that DUT explores the possibility of a shared repository of best practice cases in collaboration with other EU platforms or initiatives, such as NetZeroCities, in such a way as to ensure good enough coverage in Europe; identification of relevant metrics, monitoring and maintenance. A best-practice toolkit in circular urban economy would be useful for EU bodies, national funding bodies as well as for practitioners and researchers in the field. Most importantly, it would inspire municipalities, civil society and all other actors who might be interested to initiate circular economy collaborations by providing guidance. The database should be accompanied by a best-practice toolkit, it should be continually updated and developed over time.

Further, we believe the collaborative, 'crowdsourcing' approach has proven valuable and has potential to be developed, for example to address the following reflections and concerns:

- How can a collaborative data collection process be organised to make sure that all European countries are sufficiently well represented?
- How to make sure that grassroots, NGOs and citizen initiatives are sufficiently well represented given the innovative circular urban economy approaches (including social sustainability and cooperative initiatives) they represent as alternatives to linear commercial economy approaches?
- How can the CUE Questionnaire and CUE Scoring model be further refined and developed to meet the above?

Recommendation 2. Encourage the development of a shared evaluation framework and metrics to serve the multi-dimensional and multidisciplinary field of circular urban economy

A CUE Database could potentially improve dissemination and accelerate climate transition, however further research and innovation is necessary to identify relevant indicators with capacity to represent the multidimensional needs of the emerging research field of circular urban economy. A shared evaluation framework and new metrics are needed, given the complexity and width of the field that encompasses a range of resources and values. This represents an interdisciplinary effort that needs to be carried out in alignment with the broader fields of e.g. sustainable urban development, regenerative design and climate transition research.

A key challenge for a repository or database is to ensure that it contains relevant, up-to-date and comparable metrics in order to evaluate the impact from circular urban economy cases. Additional metrics and currencies, besides e.g. CO2e, KwH, and € are needed to account for social sustainability dimensions such as inclusion, participation, health and wellbeing, citizens' engagement time investment etc.

Recommendation 3. Implement a mapping toolbox as a work method in DUT that makes use of automatically generated dashboards as a steering instrument to accelerate circular urban economy

We recommend that DUT makes use the CUE Mapping Toolbox during 2024, to experiment and implements a work method to automatically generate dashboard reports, such as PowerBI enables.

Such a CUE mapping toolbox can, for example, be used to find and select cases from DUT-funded projects in Europe that score high, for further impact assessment relating to the CUE innovation portfolio.

It may be useful already in the process of formulating *Calls for Proposals,* enabling to more clearly target *CUE Urban Impact Values* by requesting applicants to submit information (selected questions from the *CUE Questionnaire).* Similarly, in the continued stages of the project funding process, a mapping toolbox will serve as a steering instrument to support DUT's dialogue with project leaders, to monitor progress and support the evaluation of funded projects.

5

A Tentative Framework for Clustering and Future Visualization by DUT

5.1 Four CUE Impact Value Dimensions

Once the long list of cases is collected, mapped, classified and ranked following the method described in the previous chapters, a more refined clustering and elaboration of the cases contents is possible. The following pages elaborate on a possible way to cluster the cases according to different dimensions, which are based on the three Key Areas included in the DUT Roadmap on Circular Economy. These have been reinterpreted and extended with other relevant circular dimensions in an attempt to cover most of the aspects included in circular urban economy cases by which all initiatives should find a place in the proposed framework, from simple projects to the more complex and integrated ones.

The framework is suggested not only as a way to cluster and label the collected cases, in a potential repository, but it also gives a holistic framework to define circular urban economy, and is structured based on the four impact values defined below:

1. Systemic innovation in resource efficiency and reduced waste
2. Spatial innovation and regenerative urbanism
3. Process innovation and social benefits in a circular urban economy
4. Other complementary transversal dimensions

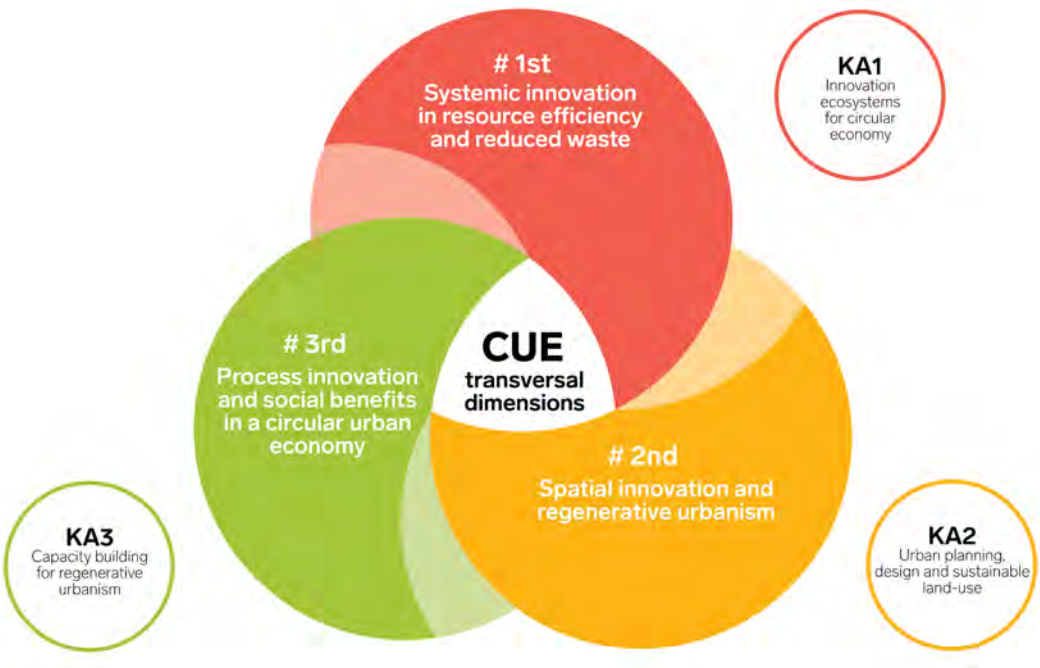


Figure 26. Four CUE impact value dimensions as the proposed framework for clustering the CUE cases. Image credits: Sweco..

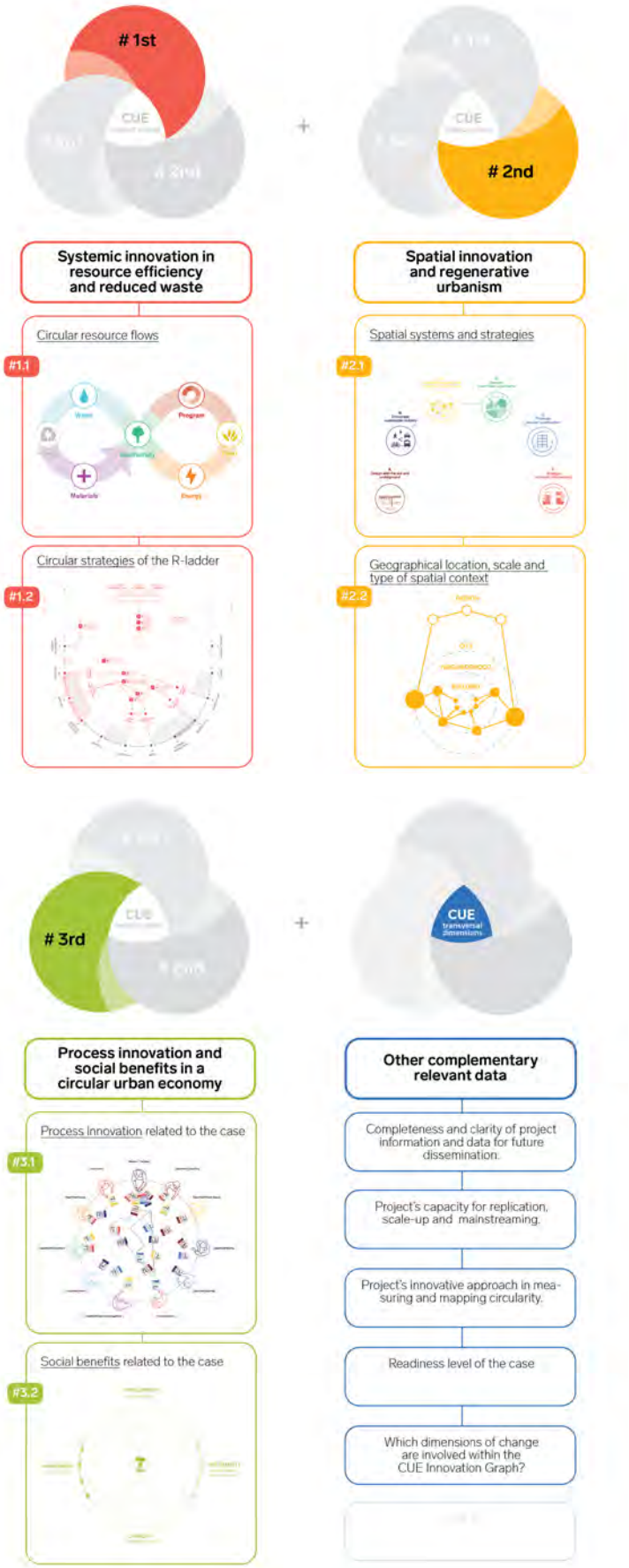


Figure 27. Four CUE impact value dimensions as the framework for clustering the CUE cases.

Systemic Innovation in Resource Efficiency and Reduced Waste

Circular Resources

Optimizing resources is, in essence, one of the prime objectives of circular economy. Identifying which resource(s) a case addresses is thus a first logic way to cluster circular economy cases. The following selection of resources have been retained, which are recurrent in most of the encountered cases:

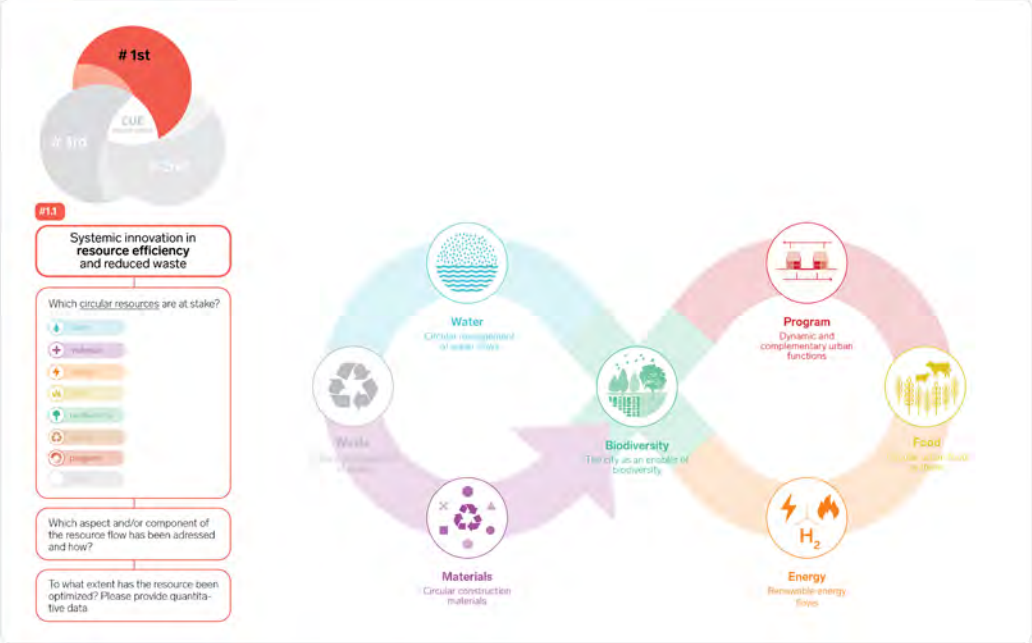


Figure 28. Circular flow diagram. Image credits: Sweco.
Figure based on the project: Circular District Ostend Oosteroever by the City of Ostend and OVAM, Belgium.

- **Water:** Circular management of water flows including rainwater management, grey water management, drinking water management, etc. across different users (industry, domestic use, agriculture, etc.) and context types.
- **Waste:** Reducing all forms of waste and finding ways to valorize it, aiming at a zero waste cities and communities.
- **Materials:** Circular management and design of construction materials is fundamental and unfolds in a multiple range of solutions including circular material design, dismantling process, construction material and components reuse, etc.
- **Food:** Circular management of food systems is a growing concern with a multitude of cases dealing with local food production initiatives in different urban contexts, organic waste management, avoiding food waste in different ways, producing food with waste, etc.
- **Energy:** Renewable energy flows deal with the optimization of energy consumption and renewable energy production, including positive energy districts, passive housing, residual energy reuse, district heating networks, and other related initiatives.
- **Biodiversity:** Circular management of biodiversity has to do with considering the city as an ecosystem, where the natural habitat can play an active role in delivering ecosystem services (biomass to produce energy for instance), and in restoring ecosystems (decontaminating sites via phytoremediation, capturing CO2 via biochar, etc.).

- **Shared programs:** This topic considers the existing urban (built) spaces in cities as (often underused) resources with potential to be optimized and shared via agreements among stakeholders and a good management system. This avoids the need to build unnecessary infrastructure and reduces spatial redundancies in cities. A couple of examples include the double use of private parking lots, meeting rooms or event spaces among different organizations.

Some cases focus solely on one resource flow (or even in a particular aspect of a resource flow) while other cases may deal with several resources. A distinction between primary resource addressed and secondary resources addressed could be made when classifying the cases. Other resources such as textiles have not been included in this list as considered not urban.

An important question here is to which extent can the optimizations of the resources be quantified and monitored with indicators?

10R Circular Strategies

A complementary way to cluster cases is linking them to the 10R-circular strategies (based on a framework by Potting et al 2017, also referred to as the R-Hierarchy or the R-Ladder), which are quite known among academics and practitioners dealing with circularity and have been conceptualized in different ways (the categorization below is based on the classification as defined by Circularise and Circle Economy). The 10R strategies offer a useful tool for visualising and understanding the different stages of resource use and waste management, and guide how circular design and manufacturing can keep resources in use and waste out of the environment.

The ten R-strategies fall under a hierarchy and are classified under three categories (from circular to linear). The higher they are on the ladder, the tighter the waste loop: this means the strategy requires fewer materials and is therefore more circular. Smaller numbers also indicate the beginning of the value chain, while larger numbers the end or the value chain.

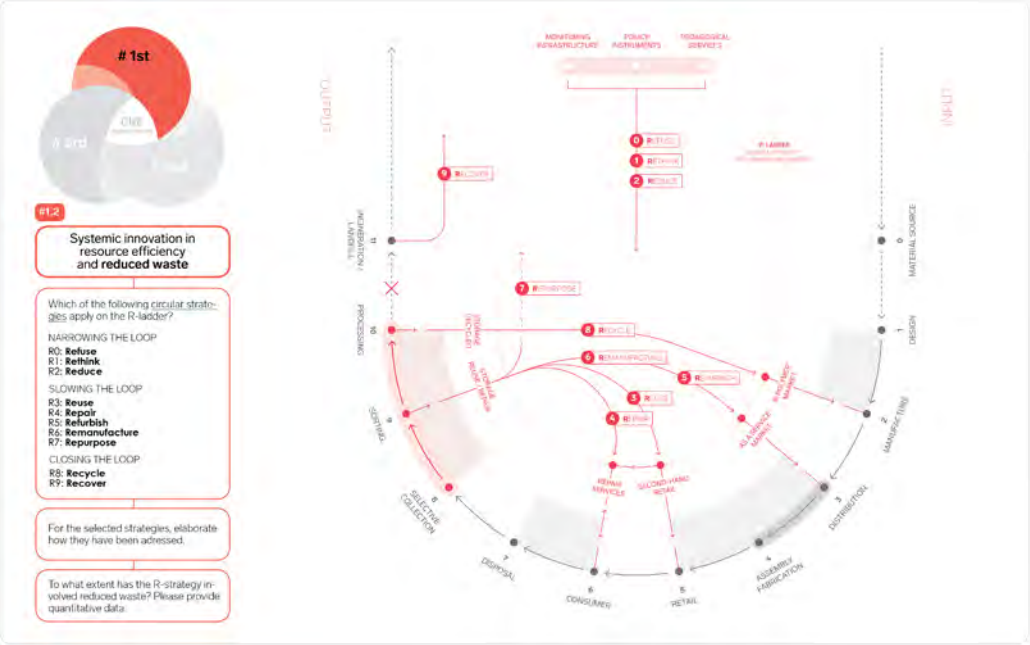


Figure 29. 10R strategies applied to the steps of a production chain. Image credits: Sweco. Figure based on the project: Climate City Contract of the City of Leuven, Belgium.

NARROWING THE LOOP – Efficient use of products and manufacturing operations

R0 - Refuse: make the product redundant by abandoning its function or by offering the same ability and function in a fundamentally different product.

R1 - Rethink: rethink the usage of products e.g.: consumers sharing products.

R2 - Reduce: efficiently manufacturing of products e.g. through minimizing natural resource and material usage.

SLOWING THE LOOP – Extension of product lifecycle to several lifecycles

R3 - Reuse: the product is reused by another consumer while still remining original abilities.

R4 - Repair: repair the product to enable original abilities to properly function.

R5 - Refurbish: refurbishing the product to original condition.

R6 - Remanufacture: dismantle the product and reuse parts in the manufacturing of new products (with the same abilities and functions).

R7 - Repurpose: use discarded product or its parts in a new product (with other abilities and functions)

CLOSING THE LOOP – Maximisation of material usefulness

R8 - Recycle: process the product to obtain material which can be used in manufacturing of new products.

R9 - Recover: incineration of material for energy recover.

The diagram below gives an illustration of how the 10R strategies can intervene in the different steps of a product life-cycle, from the design/material source to the incineration/landfill, closing, slowing or narrowing the loops at different stages.

Spatial Innovation and Regenerative Urbanism

Scale and type of urban context

The spatial scale at which a case operates is also relevant and can range from a European circular program, with projects in several cities (XXL scale); a national or regional circular program (XL scale); a city-wide circular strategy involving different sectors and locations (L scale); a circular neighbourhood (M scale); or an urban block, building, public space or street where circularity is implemented (S scale). The smaller scale (XS) dealing with specific circular components has not been included as considered not urban enough. Logically, the larger the scale the more abstract, complex and policy-oriented a case is, often involving several sectors, stakeholders and locations, while smaller scale cases can be simpler.

The context in which a case operates is also a relevant criterion to cluster circular urban economy cases as the circular strategies can strongly differ in an industrial area than in a residential neighbourhood, for instance. Therefore the proposal to include the following types of spatial contexts: city centre, residential neighbourhood, hybrid mixed area, Industrial area, city edge, green-blue corridor, peri-urban area, etc. This classification can enable users to find inspiring cases in similar contexts to the ones they are operating in. In some cases though the spatial context might not be relevant or several contexts may apply.

Figure 30. Scales and types of urban context. Image credits: Sweco.

Spatial systems and strategies

The 'urban' condition of the Circular Urban Economies Transition Pathway in DUT motivates the integration of a set of spatial systems and related strategies as part of the clustering approach of European circular cases. Circular economy cases can sometimes be almost intangible (non-related to the physical-spatial sphere) while most often they do manifest in space. The proposal below aims to broaden the repertoire of spatial systems where circularity can have an impact, beyond the well known initiatives related to circular architecture for instance. These include:

- **Design with the soil and underground:** soil remediation, reuse of uncontaminated excavated soil, multifunctional utility networks, district heating, etc.
- **Encourage sustainable mobility:** adaptive parking solutions, smart logistics loops, supporting infrastructure for alternative means of transport, etc.
- **Improve the quality and capacity of open spaces:** multifunctional, flexible and collective open spaces, reused materials and street furniture in the public domain, etc.
- **Restore green-blue ecosystems:** nature based-solutions, circular water drainage and infiltration systems, increase the permeability of paved surfaces, etc.
- **Promote circular construction:** building with modular and flexible structures, circular construction and reusing materials, adaptive reuse of existing structures, etc.
- **Strategic economic interweaving:** interweaving of private and public functions within the same building, synergies between open spaces and the urban context, etc.

The more strategies a case implements the more circular and holistic it is. For each of these spatial systems a set of related strategies could be developed and illustrated with action cards, as the scheme below suggests. These would make the strategies explicit by describing and illustrating what they entail, and illustrated with examples, offering a rich repertoire and systematization of circular solutions applied to urban contexts from which to draw inspiration.

Figure 31. Spatial systems and strategies. Image credits: Sweco.
Figure based on the project: Circular District Ostend Oosteroever by the City of Ostend and OVAM, Belgium.

Process Innovation and Social Benefits in a Circular Urban Economy

Process innovation

Process innovation has to do with new ways of organizing the stakeholders of a case, instigating change and new ideas by bringing people together, exchanging knowledge, finding win-win situations, etc.. as well as on making projects endure through time thanks to reaching agreements, building new coalitions, ensuring a solid human base and organization behind a given initiative, etc.

In this regard, there is an interest in collecting information on how the cases have managed their process and involved stakeholders, distilling a project's success factors (from which to draw inspiration) but also it's barriers (from which to learn from). Some of the key questions that could be asked include:

- Does the case foster or promote co-design and participation processes?
- Have any capacity building processes been implemented to mobilize people for a transformative change?
- Does the case include innovative methods of project leadership and management and to achieve coalitions among the actors involved?
- Have any implementation breakthroughs been achieved?
- Does the case include innovative planning tools and methods to achieve the desired transition?
- Which type of stakeholders have been involved?

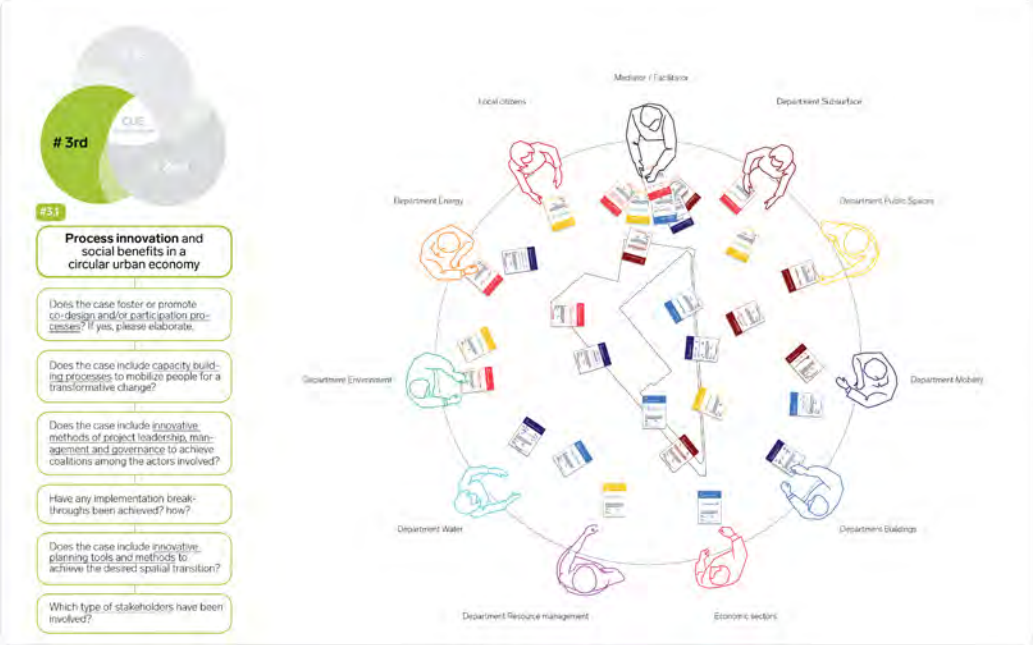


Figure 32. Process innovation aspects. Image credits: Sweco.

Social benefits

The social dimension of cases has emerged as a key topic in many of the circular urban economy cases encountered, from the grass-root initiatives to the more corporate ones. In the societal and environmental challenge of making waste redundant people's awareness, motivation, contribution and involvement is crucial.

In this regard it is interesting to take into account a case's capacity to create jobs, to create awareness and a mindset shift, to promote capacity building to empower citizens to take action by themselves, to promote a Do It Yourself circular urbanism to facilitate social and economic change from the ground up or, more generally to create a better life quality and well-being. The list of social benefits could be further extended, the above mentioned topics are just a few examples.

The social benefits that a particular case can bring is thus an important parameter to promote and to evaluate, acknowledging the fact that some of these can be quantified while others simply can't. The diagram below suggests a possible way to visualize and measure the different social dimensions involved in a circular case, the topics of which could undoubtedly be broadened and refined.

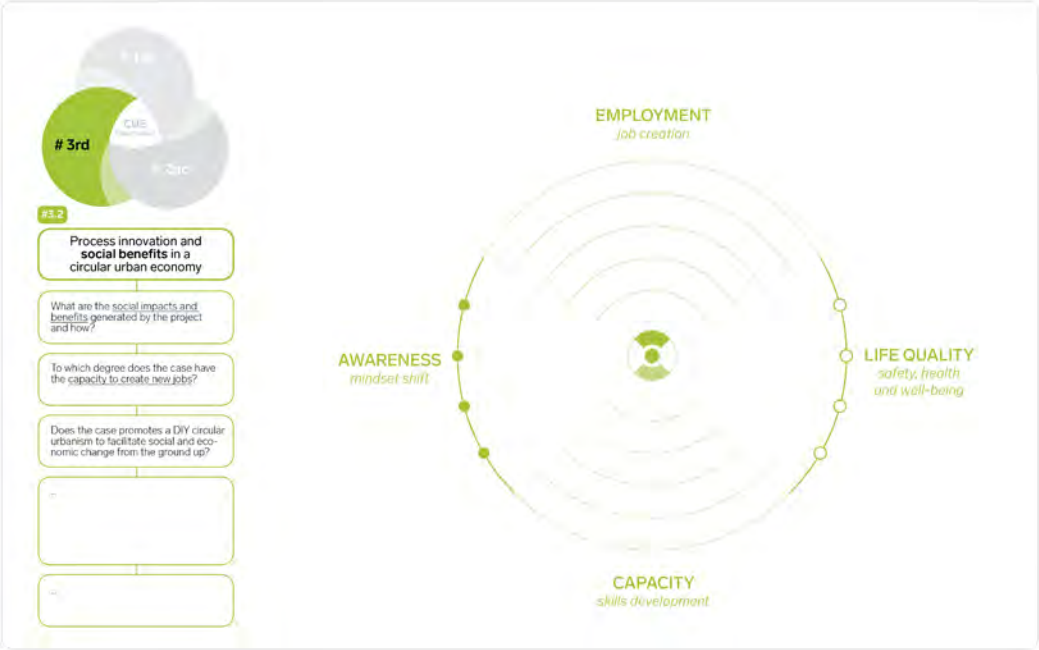


Figure 33. Social benefits indicative diagram. Image credits: Sweco.

Other Complementary Relevant Data

Transversal complementary dimensions

In addition to the previously described clustering criteria for circular urban economy cases, there are other complementary and relevant transversal dimensions that should be taken into account when selecting and evaluating cases:

1. Clarity and completeness of information and data for future dissemination: does the case have a website? Are reports, presentations or other forms of documentation available to better understand the case?
2. Innovative approach in measuring and mapping circularity: does the case innovate with advanced data management and monitoring to measure circularity? Have specific measuring tools or indicators been applied?
3. Capacity for replication, scale-up and mainstreaming: how transferable is the case to other similar contexts? Can the case be scaled-up and broaden its impact beyond its specific location? Can the case become mainstream and appropriated by a wide public?
4. Case readiness and maturity level: which is the maturity level of the case, from the good idea to real implementation?
5. Case's enabling success factors: have some of the following dimensions been involved? disruptive technology, innovative business models, sharing economy, digitalization, design and planning, etc.
6. Case's dimensions of change within the CUE Innovation Graph: culture and values, regulatory framework, infrastructure and production systems, business models, technologies, products and processes.

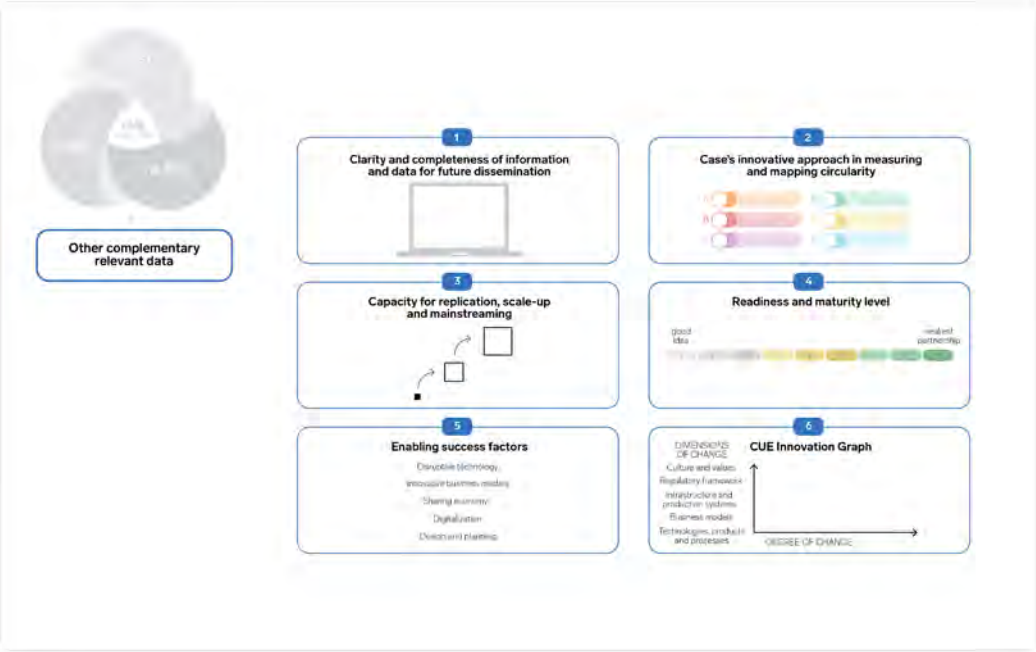


Figure 34. Transversal complementary dimensions. Image credits: Sweco.

5.2 Communication and Online Visualization of CUE Cases

Possible Ways To Present and Visualize the CUE Cases in a DUT Online Repository

In an effort to make the collected cases as widespread as possible, a crucial tool that is recommended to the DUT partnership would be to set-up an online repository of Circular Urban Economy cases, linked to the DUT website.

Having screened different websites addressing circular urban economy cases in Europe, there are very few to be found, are often focused on only certain aspects of circular economy, and scarcely deal with circularity in a holistic way. There is thus an opportunity and interest for the DUT to make a difference, by developing a powerful online repository of well-structured and visually appealing cases addressing circular urban economy, enabling users to filter and select cases according to different criteria.

This tool would contribute to reinforce the DUT's position as a key European partner in the circular transition, by empowering itself with a rich repertoire of cases from which many lessons are to be learned. The database should be expanded also with DUT's funded circular urban economy projects which, in turn, could find inspiration from the other collected cases. The website can also be a way to stress DUT's priorities and approach when dealing with urban circularity.

Such an initiative should be conceived and developed equally and aligned with the other two DUT Transition Pathways: the Positive Energy Districts TP and the 15 Minute City TP. Below are a few teaser examples of what such a website could look like, by presenting the cases in a clear and attractive way

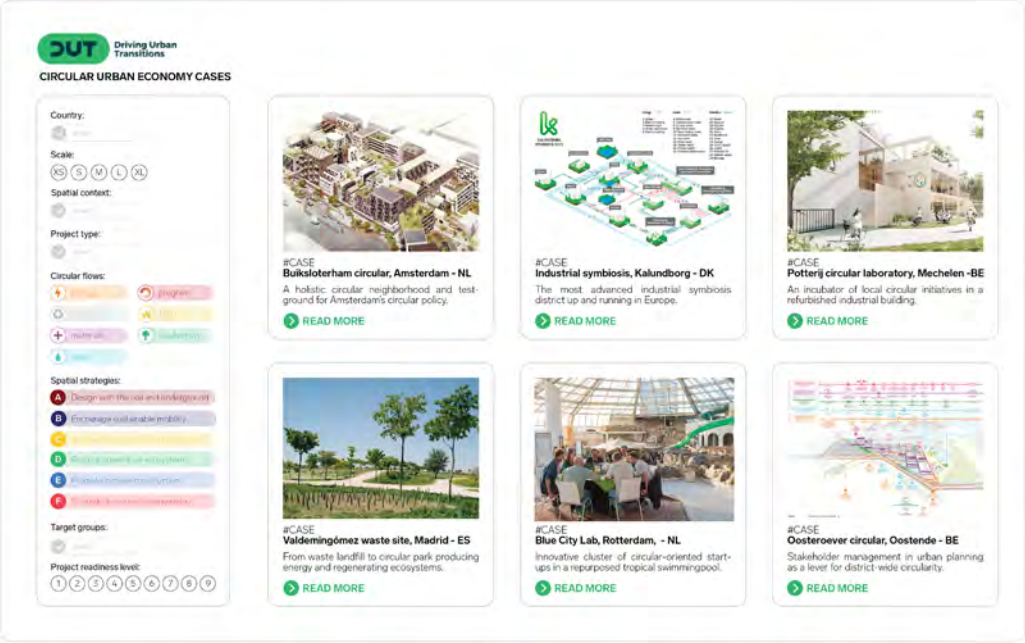


Figure 35. Example of how to visualize the cases in a future website. Image credits: Sweco.

Figure 36. Example of how to visualize the cases in a European map in a future website. Image credits: Sweco.

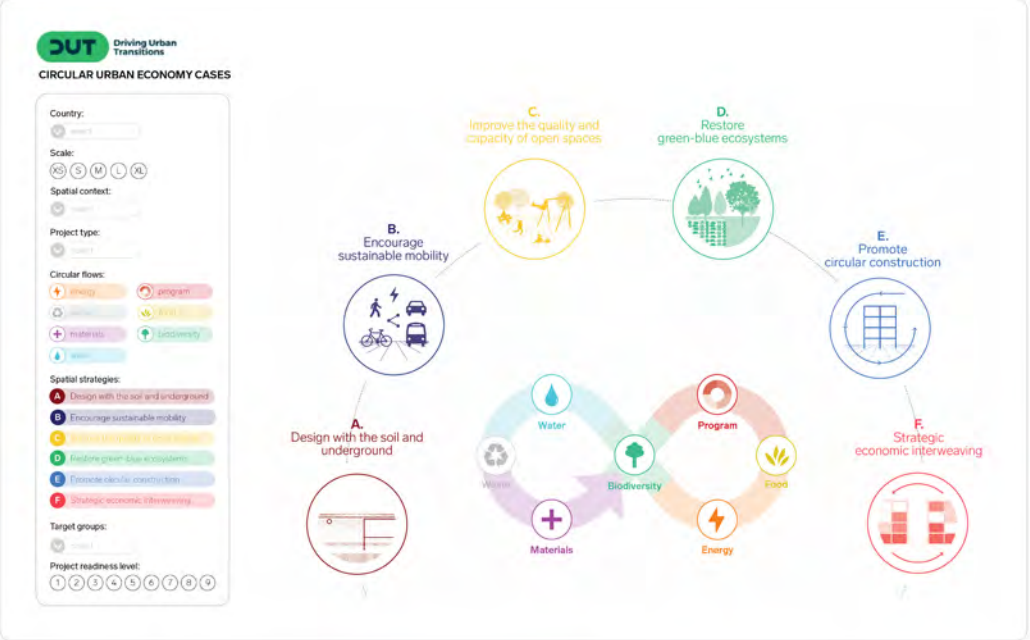
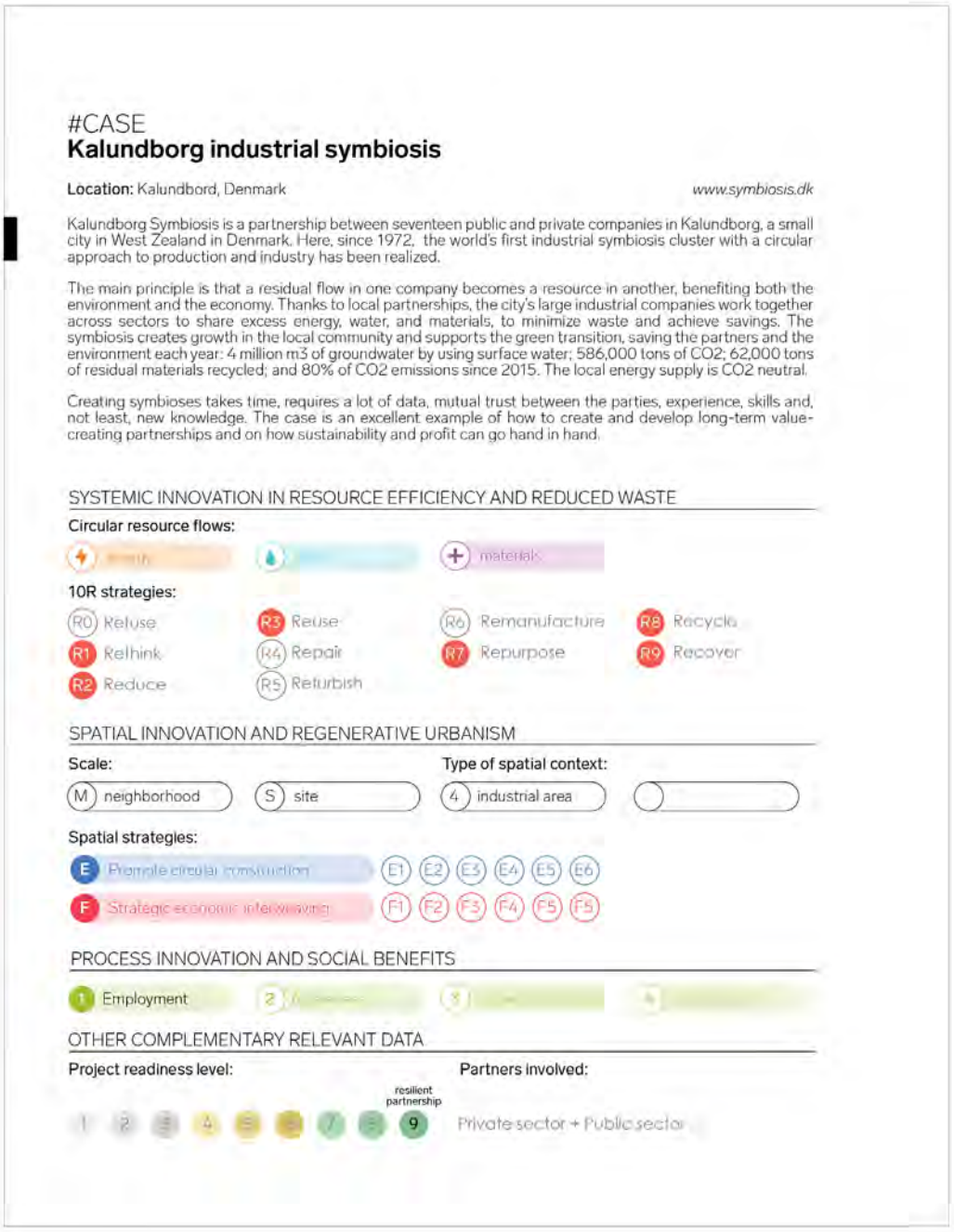


Figure 37. Example of how to visualize the CUE clustering approach in a future website. Image credits: Sweco.

Examples of Fully Visualized Cases Following The Four Impact Values

Case #01, CUE Score: 42 (of possible 85 points)



#CASE
Kalundborg industrial symbiosis

Location: Kalundbord, Denmark *www.symbiosis.dk*

Kalundborg Symbiosis is a partnership between seventeen public and private companies in Kalundborg, a small city in West Zealand in Denmark. Here, since 1972, the world's first industrial symbiosis cluster with a circular approach to production and industry has been realized.

The main principle is that a residual flow in one company becomes a resource in another, benefiting both the environment and the economy. Thanks to local partnerships, the city's large industrial companies work together across sectors to share excess energy, water, and materials, to minimize waste and achieve savings. The symbiosis creates growth in the local community and supports the green transition, saving the partners and the environment each year: 4 million m3 of groundwater by using surface water; 586,000 tons of CO2; 62,000 tons of residual materials recycled; and 80% of CO2 emissions since 2015. The local energy supply is CO2 neutral.

Creating symbioses takes time, requires a lot of data, mutual trust between the parties, experience, skills and, not least, new knowledge. The case is an excellent example of how to create and develop long-term value-creating partnerships and on how sustainability and profit can go hand in hand.

SYSTEMIC INNOVATION IN RESOURCE EFFICIENCY AND REDUCED WASTE

Circular resource flows:

10R strategies:

R0 Refuse · R3 Reuse · R6 Remanufacture · R8 Recycle
R1 Rethink · R4 Repair · R7 Repurpose · R9 Recover
R2 Reduce · R5 Refurbish

SPATIAL INNOVATION AND REGENERATIVE URBANISM

Scale: M neighborhood · S site

Type of spatial context: 4 industrial area

Spatial strategies:

E Promote circular construction E1 E2 E3 E4 E5 E6
F Strategic economic interweaving F1 F2 F3 F4 F5 F6

PROCESS INNOVATION AND SOCIAL BENEFITS

1 Employment

OTHER COMPLEMENTARY RELEVANT DATA

Project readiness level: 9 resilient partnership

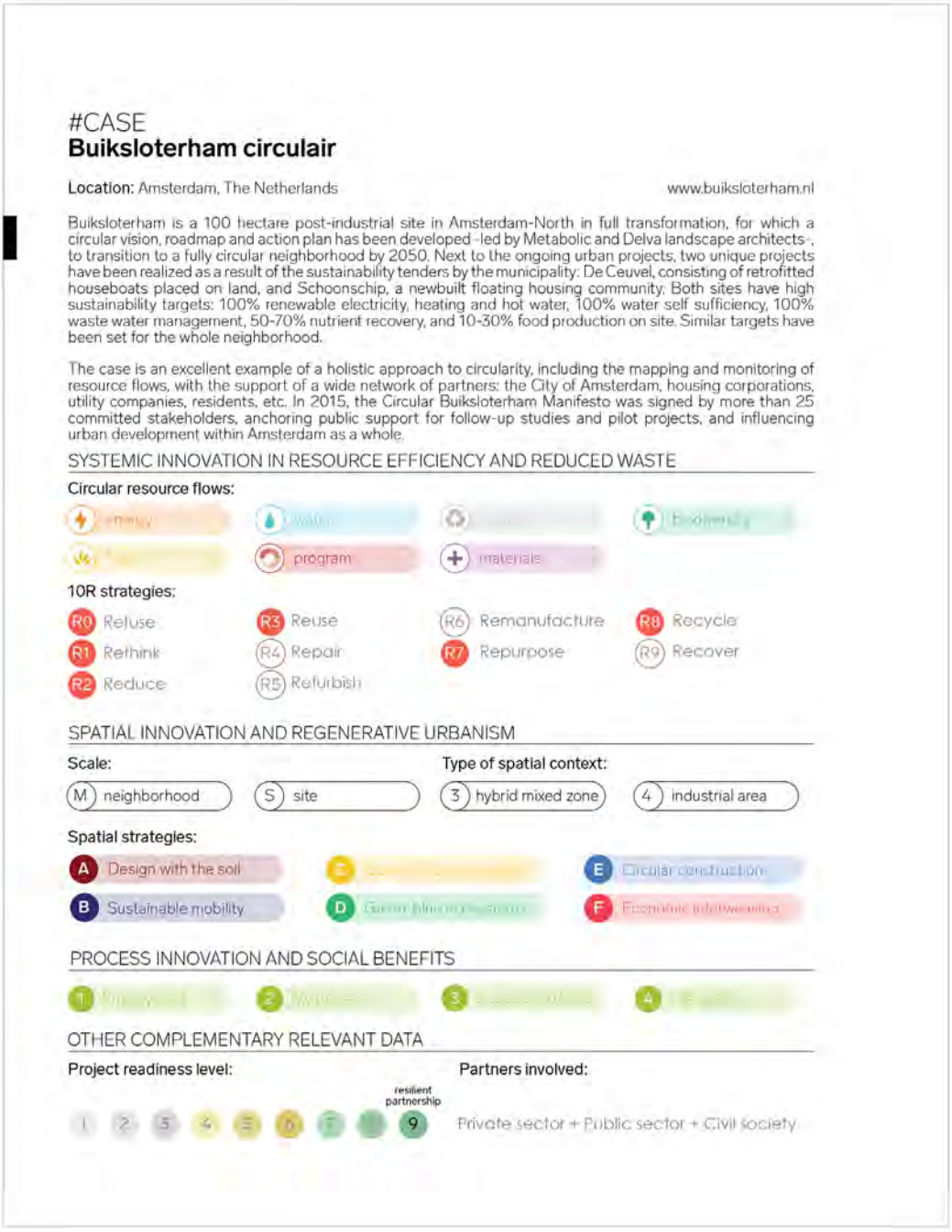
Partners involved: Private sector + Public sector

Figure 38. Case 01 visualization example, page 1.

Case #01

Figure 38. Case 01 visualization example, page 2.

Case #02, CUE Score: 66 (of possible 85 points)



#CASE
Buiksloterham circulair

Location: Amsterdam, The Netherlands www.buiksloterham.nl

Buiksloterham is a 100 hectare post-industrial site in Amsterdam-North in full transformation, for which a circular vision, roadmap and action plan has been developed -led by Metabolic and Delva landscape architects-, to transition to a fully circular neighborhood by 2050. Next to the ongoing urban projects, two unique projects have been realized as a result of the sustainability tenders by the municipality: De Ceuvel, consisting of retrofitted houseboats placed on land, and Schoonschip, a newbuilt floating housing community. Both sites have high sustainability targets: 100% renewable electricity, heating and hot water, 100% water self sufficiency, 100% waste water management, 50-70% nutrient recovery, and 10-30% food production on site. Similar targets have been set for the whole neighborhood.

The case is an excellent example of a holistic approach to circularity, including the mapping and monitoring of resource flows, with the support of a wide network of partners: the City of Amsterdam, housing corporations, utility companies, residents, etc. In 2015, the Circular Buiksloterham Manifesto was signed by more than 25 committed stakeholders, anchoring public support for follow-up studies and pilot projects, and influencing urban development within Amsterdam as a whole.

SYSTEMIC INNOVATION IN RESOURCE EFFICIENCY AND REDUCED WASTE

Circular resource flows:

program

materials

10R strategies:

R0 Refuse
R1 Rethink
R2 Reduce
R3 Reuse
R4 Repair
R5 Refurbish
R6 Remanufacture
R7 Repurpose
R8 Recycle
R9 Recover

SPATIAL INNOVATION AND REGENERATIVE URBANISM

Scale:

M neighborhood
S site

Type of spatial context:

3 hybrid mixed zone
4 industrial area

Spatial strategies:

A Design with the soil
B Sustainable mobility
E Circular construction

PROCESS INNOVATION AND SOCIAL BENEFITS

OTHER COMPLEMENTARY RELEVANT DATA

Project readiness level:

resilient partnership

Partners involved:

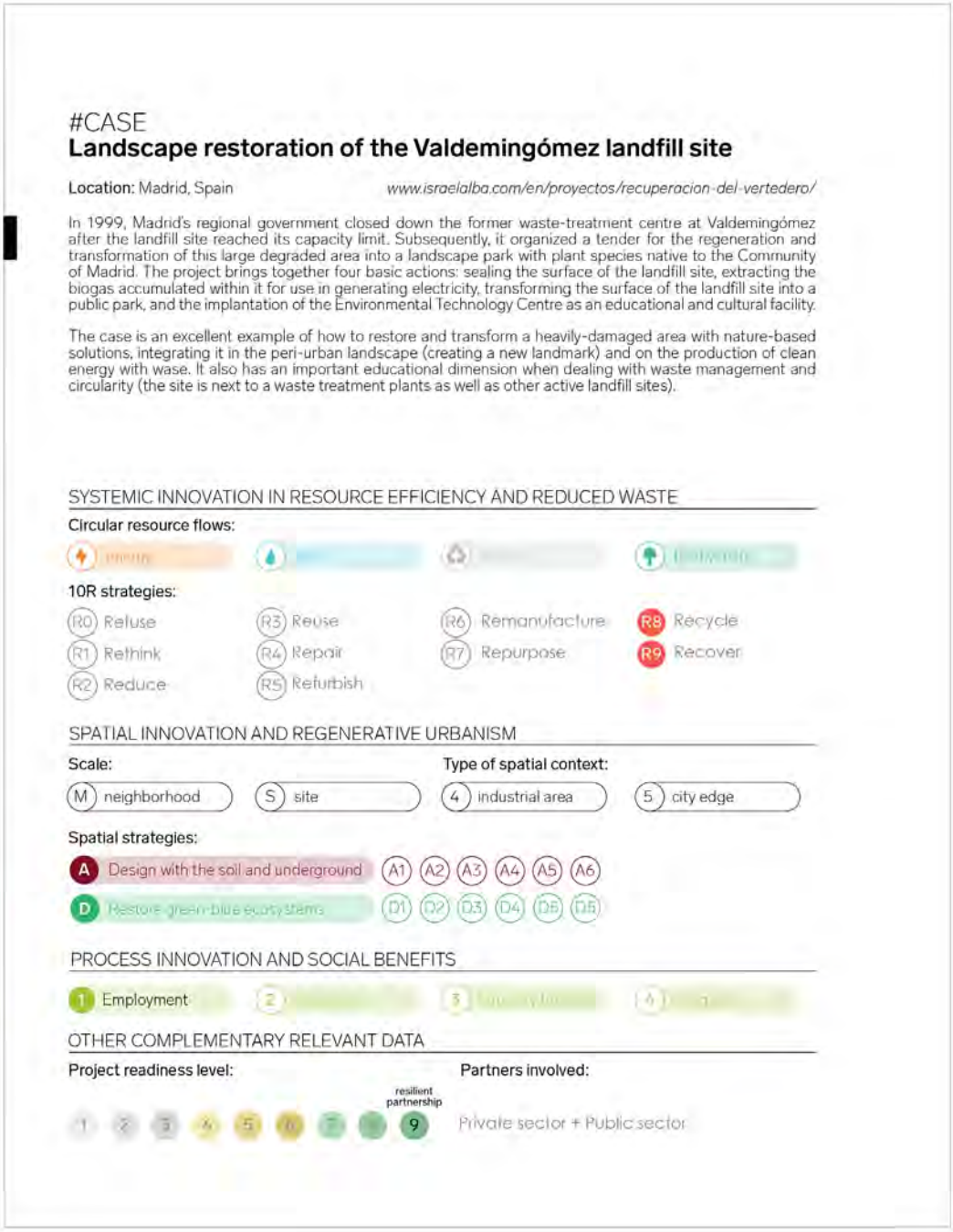
Private sector + Public sector + Civil society

Figure 39. Case 02 visualization example, page 1.

Case #02

Figure 39. Case 02 visualization example, page 2.

Case #03, CUE Score: 52 (of possible 85 points)



#CASE

Landscape restoration of the Valdemingómez landfill site

Location: Madrid, Spain *www.israelalba.com/en/proyectos/recuperacion-del-vertedero/*

In 1999, Madrid's regional government closed down the former waste-treatment centre at Valdemingómez after the landfill site reached its capacity limit. Subsequently, it organized a tender for the regeneration and transformation of this large degraded area into a landscape park with plant species native to the Community of Madrid. The project brings together four basic actions: sealing the surface of the landfill site, extracting the biogas accumulated within it for use in generating electricity, transforming the surface of the landfill site into a public park, and the implantation of the Environmental Technology Centre as an educational and cultural facility.

The case is an excellent example of how to restore and transform a heavily-damaged area with nature-based solutions, integrating it in the peri-urban landscape (creating a new landmark) and on the production of clean energy with wase. It also has an important educational dimension when dealing with waste management and circularity (the site is next to a waste treatment plants as well as other active landfill sites).

SYSTEMIC INNOVATION IN RESOURCE EFFICIENCY AND REDUCED WASTE

Circular resource flows:

10R strategies:

R0 Refuse, R1 Rethink, R2 Reduce, R3 Reuse, R4 Repair, R5 Refurbish, R6 Remanufacture, R7 Repurpose, R8 Recycle, R9 Recover

SPATIAL INNOVATION AND REGENERATIVE URBANISM

Scale: M neighborhood, S site

Type of spatial context: 4 industrial area, 5 city edge

Spatial strategies:

A Design with the soil and underground A1 A2 A3 A4 A5 A6

D Restore green-blue ecosystems D1 D2 D3 D4 D5 D6

PROCESS INNOVATION AND SOCIAL BENEFITS

1 Employment

OTHER COMPLEMENTARY RELEVANT DATA

Project readiness level: 9 resilient partnership

Partners involved: Private sector + Public sector

Figure 40. Case 03 visualization example, page 1.

Case #03

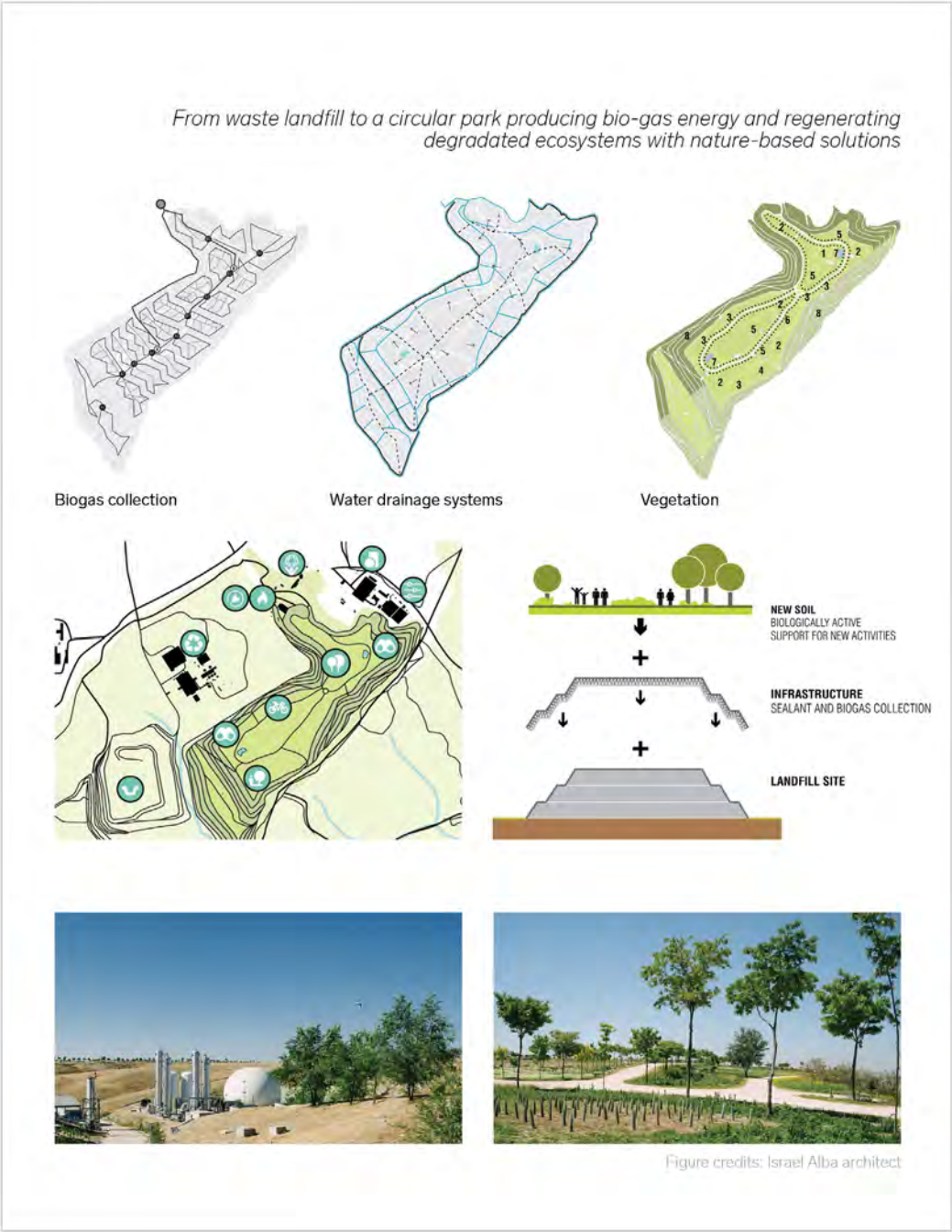
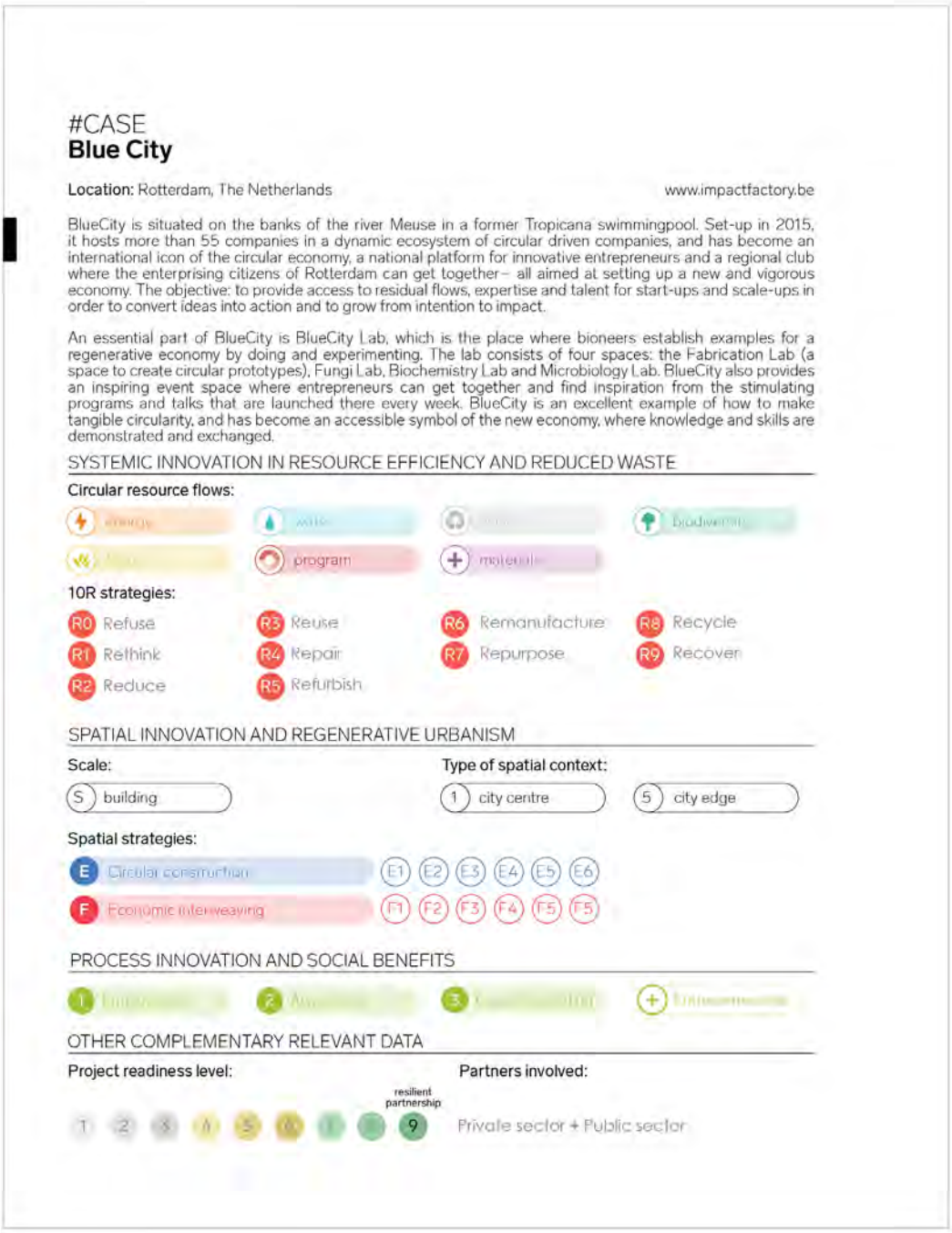


Figure 40. Case 03 visualization example, page 2.

Case #04, CUE Score 59 (of possible 85 points)



#CASE
Blue City

Location: Rotterdam, The Netherlands www.impactfactory.be

BlueCity is situated on the banks of the river Meuse in a former Tropicana swimmingpool. Set-up in 2015, it hosts more than 55 companies in a dynamic ecosystem of circular driven companies, and has become an international icon of the circular economy, a national platform for innovative entrepreneurs and a regional club where the enterprising citizens of Rotterdam can get together – all aimed at setting up a new and vigorous economy. The objective: to provide access to residual flows, expertise and talent for start-ups and scale-ups in order to convert ideas into action and to grow from intention to impact.

An essential part of BlueCity is BlueCity Lab, which is the place where bioneers establish examples for a regenerative economy by doing and experimenting. The lab consists of four spaces: the Fabrication Lab (a space to create circular prototypes), Fungi Lab, Biochemistry Lab and Microbiology Lab. BlueCity also provides an inspiring event space where entrepreneurs can get together and find inspiration from the stimulating programs and talks that are launched there every week. BlueCity is an excellent example of how to make tangible circularity, and has become an accessible symbol of the new economy, where knowledge and skills are demonstrated and exchanged.

SYSTEMIC INNOVATION IN RESOURCE EFFICIENCY AND REDUCED WASTE

Circular resource flows:

program

10R strategies:

R0 Refuse
R1 Rethink
R2 Reduce
R3 Reuse
R4 Repair
R5 Refurbish
R6 Remanufacture
R7 Repurpose
R8 Recycle
R9 Recover

SPATIAL INNOVATION AND REGENERATIVE URBANISM

Scale:

S building

Type of spatial context:

1 city centre
5 city edge

Spatial strategies:

E Circular construction
F Economic interweaving

PROCESS INNOVATION AND SOCIAL BENEFITS

OTHER COMPLEMENTARY RELEVANT DATA

Project readiness level:

resilient partnership

Partners involved:

Private sector + Public sector

Figure 41. Case 04 visualization example, page 1.

Case #04

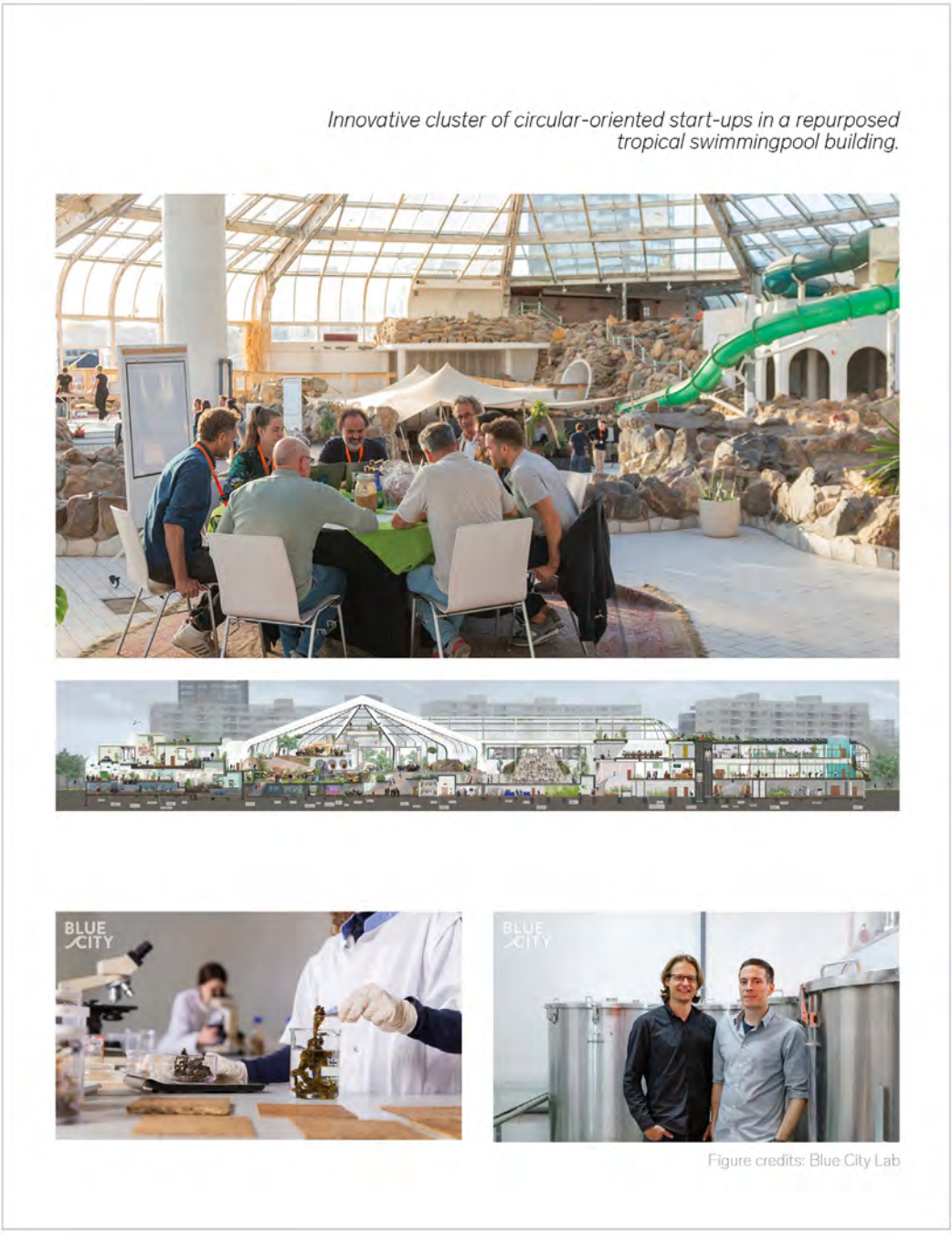
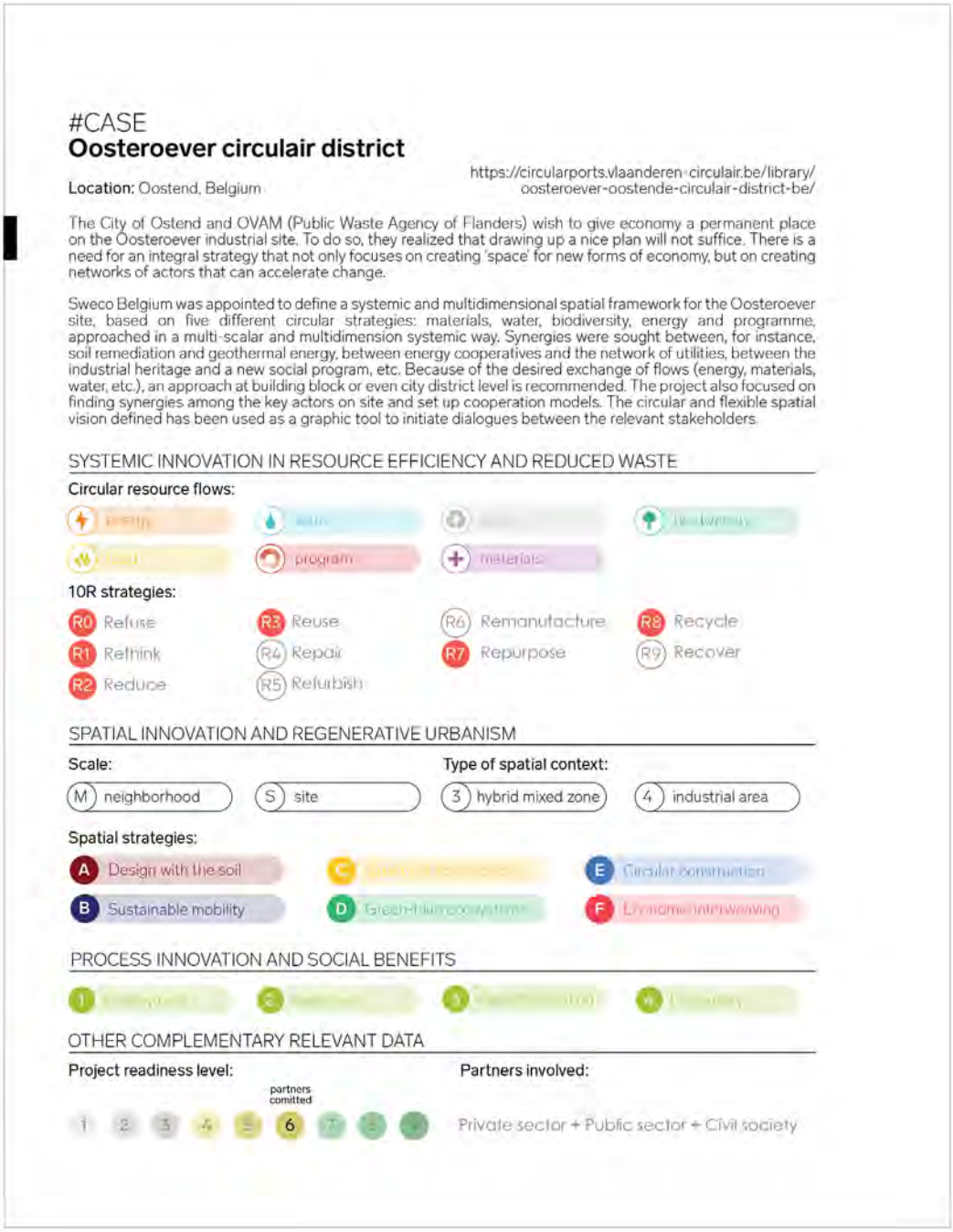


Figure 41. Case 04 visualization example, page 2.

Case #05, CUE Score 62 (out of 85 possible points)



#CASE

Oosteroever circulair district

Location: Oostend, Belgium

https://circularports.vlaanderen-circulair.be/library/oosteroever-oostende-circulair-district-be/

The City of Ostend and OVAM (Public Waste Agency of Flanders) wish to give economy a permanent place on the Oosteroever industrial site. To do so, they realized that drawing up a nice plan will not suffice. There is a need for an integral strategy that not only focuses on creating 'space' for new forms of economy, but on creating networks of actors that can accelerate change.

Sweco Belgium was appointed to define a systemic and multidimensional spatial framework for the Oosteroever site, based on five different circular strategies: materials, water, biodiversity, energy and programme, approached in a multi-scalar and multidimension systemic way. Synergies were sought between, for instance, soil remediation and geothermal energy, between energy cooperatives and the network of utilities, between the industrial heritage and a new social program, etc. Because of the desired exchange of flows (energy, materials, water, etc.), an approach at building block or even city district level is recommended. The project also focused on finding synergies among the key actors on site and set up cooperation models. The circular and flexible spatial vision defined has been used as a graphic tool to initiate dialogues between the relevant stakeholders.

SYSTEMIC INNOVATION IN RESOURCE EFFICIENCY AND REDUCED WASTE

Circular resource flows:

program

materials

10R strategies:

R0 Refuse
R1 Rethink
R2 Reduce
R3 Reuse
R4 Repair
R5 Refurbish
R6 Remanufacture
R7 Repurpose
R8 Recycle
R9 Recover

SPATIAL INNOVATION AND REGENERATIVE URBANISM

Scale:

M neighborhood
S site

Type of spatial context:

3 hybrid mixed zone
4 industrial area

Spatial strategies:

A Design with the soil
B Sustainable mobility

PROCESS INNOVATION AND SOCIAL BENEFITS

OTHER COMPLEMENTARY RELEVANT DATA

Project readiness level:

partners comitted

1 2 3 4 5 6 7 8 9

Partners involved:

Private sector + Public sector + Civil society

Figure 42. Case 05 visualization example, page 1.

Case #05

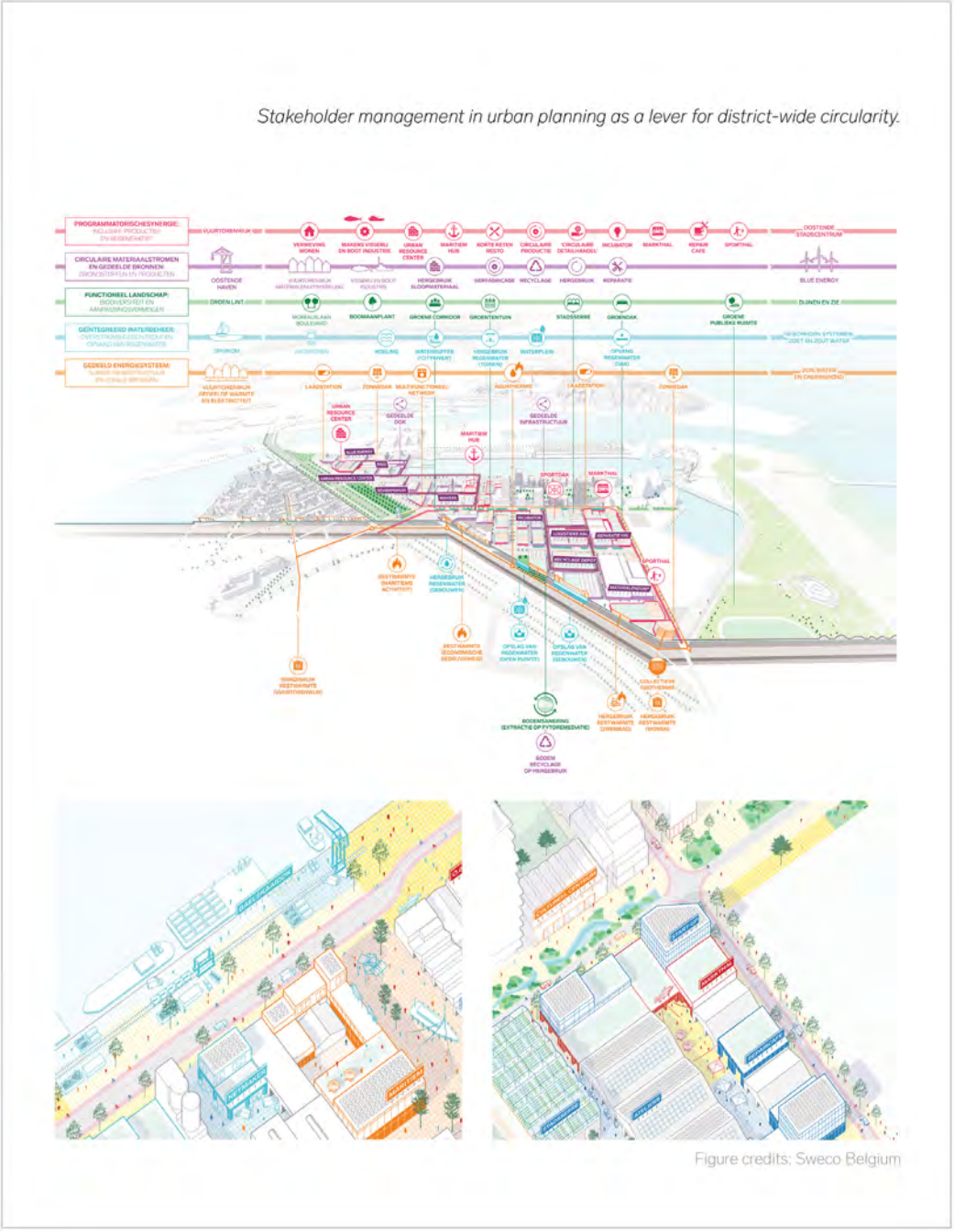


Figure 42. Case 05 visualization example, page 2.

5.3 Reflections and Future Recommendations

In this study the main focus was on the mapping methodology, including a forward-looking approach towards potential further alignment of the selection criteria for this mapping. Additionally, the study explored the possibilities for visualization and data processing for the core team of the CUE Transition Pathway

From the broad input provided by the cases, it is now possible to reflect on the actual impact of these in creating a sustainable living environment on the field. Below are some reflections on the possible next steps to embed the takeaways from the study and the input provided from the cases into the DUT strategy.

Recommendation 1. Alignment of the CUE Mapping Approach With the DUT CUE Calls and Projects

The overview of cases provides valuable insights into the strategies employed, including spatial circular strategies, stakeholder management strategies, and strategies for system change. Those strategies are implemented at various scales, such as the project level, the urban level, and the regional network level. Furthermore, a wide range of stakeholder networks is involved, including academics, local and regional governments, initiators, community-oriented organizations, etc.

These insights serve as important input for refining the description of future calls and for sharpening the selection criteria for projects in order to maximize their impact on a sustainable urban context.

The dynamic data collection process can lead to strategic feedback loops within the CUE Transition Pathway in DUT. It allows for the adjustment of selection criteria for the cases or the emphasis on supporting the scaling up of certain groups of cases with promising impact. Other cases, which may have a significant impact over time, can develop autonomously and may require less support from the DUT program. By incorporating these reflections and recommendations, the DUT strategy can be further strengthened and adapted to drive sustainable urban transformation.

Figure 43. Circular urban economy projects being realized. Potterij Impact Factory, Mechelen, BE.
Image credits: BUUR Part of Sweco.

Alignment Among the Three Transition Pathways

We are currently experiencing many changes due to the urgent need to address climate change and planetary boundaries. These changes affect how we produce energy, make products, grow food, and transport goods. We are also working on managing water resources, restoring biodiversity, and enhancing nature to combat issues like drought and flooding.

These transitions have an important spatial component and are rapidly reshaping urban areas. It is essential for our cities and communities to be ready to support and accelerate these developments. As spatial transition is a complex and gradual process compared to the rapid advancements in technology and economic business models. Resilient cities and municipalities play a crucial role in facilitating these transitions.

The DUT programs focus on three specific pathways: Positive Energy Districts, the 15-Minute City, and the Circular Urban Economy. These pathways aim to find clearer ways to transition, which involves two parallel dynamics: breaking down old systems and building up new ones (Figure 44).

By exchanging insights and successful strategies these three pathways can mutually reinforce each other. The shared objectives of the DUT programs involve refining strategies, drawing lessons from experiences, and inspiring and motivating the target audience to take action.

To strengthen the shared transition goal among the programs, it is of interest to establish connections and synchronization between mapping methodologies, visualization for knowledge dissemination, common takeaways, and strategies as a next step. This would offer a more comprehensive overview of the ongoing Driving Urban Transition and encourage interdisciplinary research.

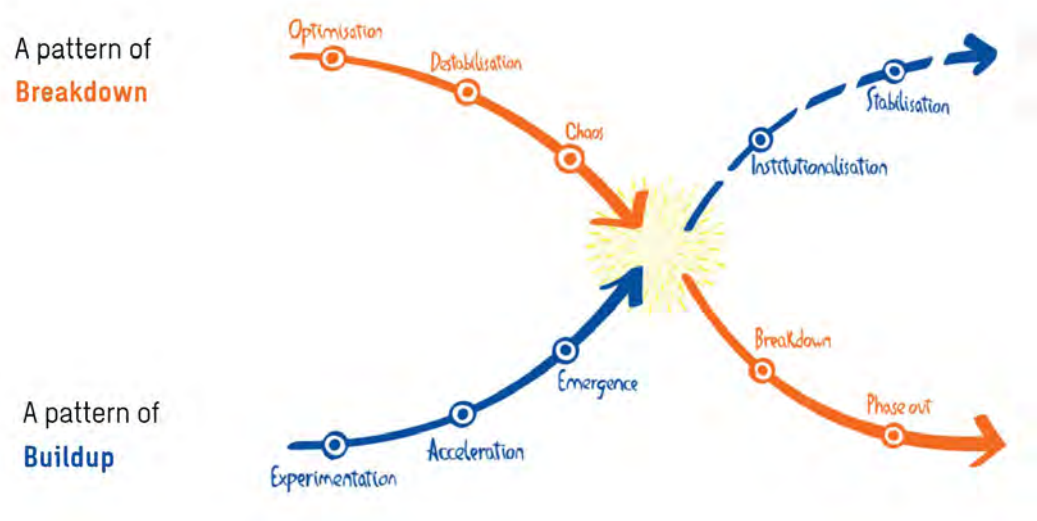


Figure 44. Two patterns of system change. Image credits: X-Curve publication by Drift-EIT Climate KIC-Transitions Hub.

Aspects Related to the DUT Governance and Role in the EU With Respect to CUE

In the context of circular urban transitions, effective governance plays a crucial role in driving sustainable and innovative solutions. The initial mapping exercise conducted by the DUT team has highlighted the importance of adopting a comprehensive approach that considers both bottom-up and top-down perspectives. The mapping exercise could serve as a bridge between bottom-up perspectives (cases, projects, stakeholders, cities) and top-down governance (regional, national, and European levels) on the one hand, and between academic research and implementation in the field on the other hand.

After reviewing more than 150 cases and gathering insights from project partners through workshops, it is clear that the target audience of DUT governance is diverse, ranging from EU collaborative research projects to local initiatives on the project level and citizen-driven innovation. It may be necessary to refine the language used to clearly differentiate between these levels and emphasize the need to gather input from both for further data collection.

The DUT governance could establish three specific goals to guide its future efforts:

1. **Inspiring and encouraging stakeholders and public administrators:** the DUT governance can serve as an inspirator and motivator by collecting and disseminating successful case studies. This will empower stakeholders and public administrators, motivating them to take action towards circular urban transition.
2. **Translation of applied methodologies into concrete strategies on multiple governance levels:** the CUE Transition Pathway in DUT can serve as an accelerator and capacity builder, translating applied methodologies such as spatial innovation, process innovation, and value chain innovation into practical strategies. These strategies can be tailored to different governance levels, ranging from local to regional, national, and EU levels, thereby ensuring a comprehensive approach to circular urban transitions. Examples include insertion into town planning processes and considerations, incorporation into regional development strategies, inclusion into social and economic impact methodologies, adherence to relevant quality standards that steer urban development and construction, integration in Environment Impact Assessments. A dynamic and systemic data mapping methodology has also the potential to uncover academic research topics derived from practical experiences.
3. **Collaboration with impactful networks for a strong voice in EU strategy:** recognizing the significance of collaboration, the CUE TP can partner with other influential networks working towards circular urban transition. By doing so, the CUE TP can have a significant advisory role in shaping the EU strategy, amplifying its impact and contributing to the development of sustainable urban environments.

Influence on the DUT Roadmap as a Key Strategic Policy Document

Building upon the previous reflections, a further development of the dynamic database could contribute to the DUT roadmap to evolve towards a strategic policy document. The following suggestions emerged during discussions.

Upscaling through Data Integration

Recognizing the importance of upscaling, the combination of pilot projects and the development of city-wide strategies emerged as crucial topics. By integrating data from various pilot projects and identifying common patterns and successful approaches, cities can develop comprehensive strategies for scaling up circular urban transition initiatives. This approach ensures that the lessons learned from individual projects are leveraged to create a broader impact.

- **Interactive dashboard for continued monitoring:** to ensure the ongoing monitoring of case results, the development of an interactive dashboard is proposed. This tool can enable the evaluation of cases over a longer period, even after the cessation of funding from DUT. The evaluation of the potential combined effect of all DUT projects could be interesting. By assessing the synergies and cumulative impact of these initiatives, a more comprehensive understanding of their collective contribution to circular urban transition can be achieved.
- **A framework-based Dashboard:** the idea of developing a dashboard based on the proposed comprehensive framework received positive feedback. By structuring data collection and analysis around a unified framework, the dashboard becomes a powerful tool for visualizing and interpreting complex information. This approach enhances transparency, facilitates knowledge sharing, and supports evidence-based decision-making.

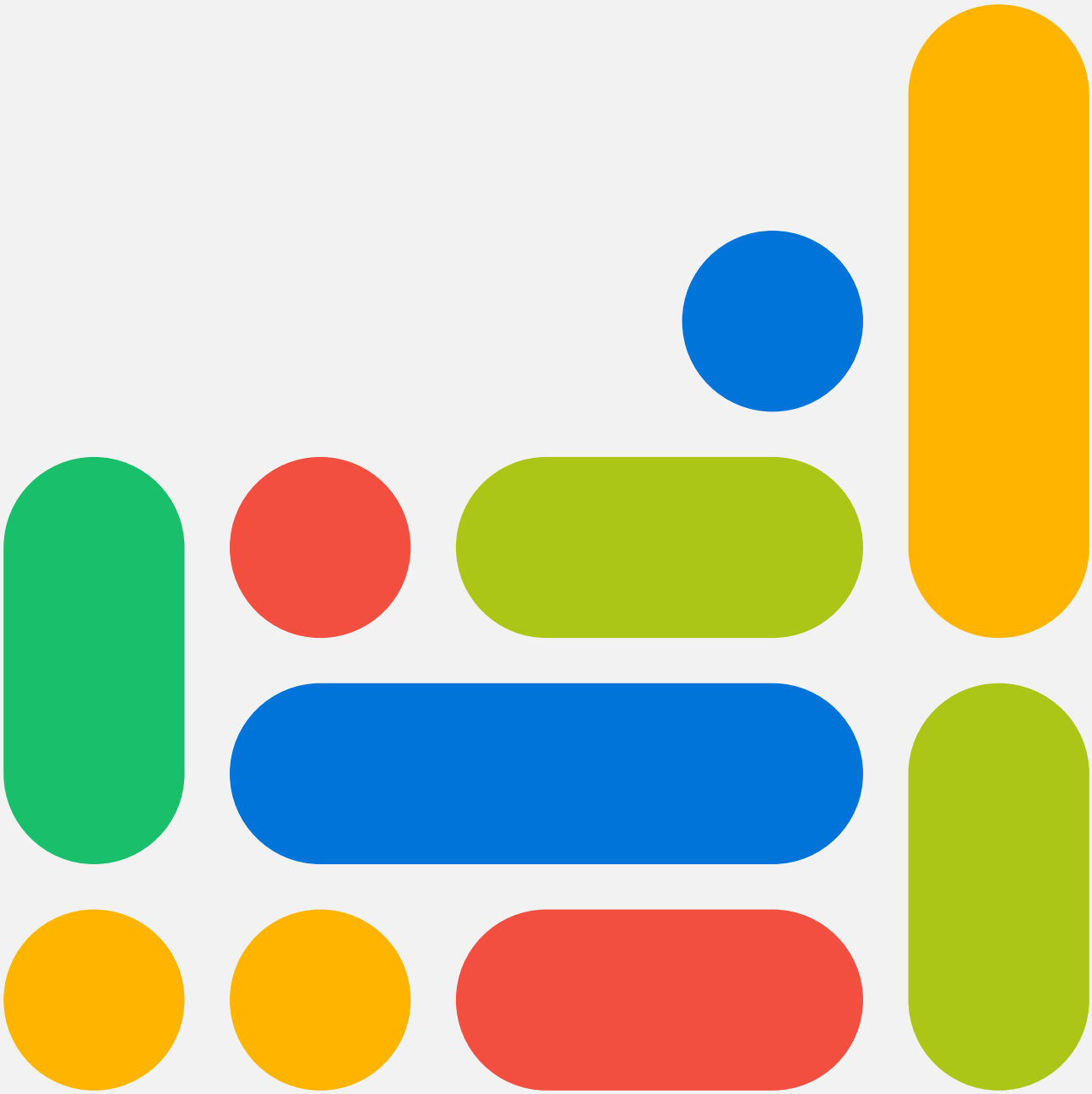
In-depth exploration of specific topics

To further enhance the understanding and implementation of the circular urban economy transition, it is important to dive deeper into specific topics. The following areas have been identified for potential further exploration:

- **Gathering input on funding and stakeholder networks:** understanding the financial aspects and the stakeholder networks involved in CUE projects funded by DUT can provide valuable insights for future funding strategies and collaboration opportunities.
- **Further research on the measurability of impact:** more research might be needed to assess the measurability of impact and the effectiveness of strategies applied in the transition towards a circular urban economy. Developing robust measurement frameworks and evaluating the outcomes of different cases can help understand and communicate the quantifiable impact of initiatives.

- **Reflecting on the project process:** conducting a comparative analysis of various cases can provide insights into alternative approaches to the traditional project process. Examining where and how solutions are applied within the decision-making process can lead to more efficient and effective implementation of strategies.
- **Investigating less measurable aspects:** placing significant emphasis on social inclusion, cultural value, environmental justice, and capacity building within projects is important for holistic and sustainable development.
- **Further segmentation of initiatives:** to ensure inclusivity and targeted interventions, initiatives could be further segmented into specific socio-economic categories or target groups. Tailoring strategies and solutions to the unique needs and characteristics of these groups can maximize the impact and benefits.
- **Developing specific strategies for key CUE topics in DUT:** more specific strategies are needed for important CUE topics, such as Nature-Based Solutions, Urban Food Systems, and Integrated Water Management.
- **Including policy, decision-making, and legal/regulatory impact:** a deeper reflection on the impact on policy, decision-making processes, and legal/regulatory frameworks should be considered. This includes evaluating the influence of the transition on planning and building codes, as well as assessing its alignment with policy objectives and regulatory frameworks.

Figure 45. Circular economy conceptual diagram. Image credits Sweco.
Figure from the Sustainability Impact Program of Sweco Belgium.



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Charlie Gullström Is Research and Innovation Strategist at Sweco and adjunct Professor in in Circular Economy for Architecture and Planning at Chalmers University of Technology. Gullström is an experienced research leader of quadruple helix initiatives to accelerate sustainable urban development, digitalisation and the transition to a circular urban economy. Following an extensive academic career, she currently coordinates Sweco Architects' research and innovation through a multidisciplinary effort that leverages on experts in a broad range of technical fields. She is a strategic advisor to several Swedish cities in transition to become climate-neutral by 2030, both as part of the Swedish framework Viable Cities, and EU's Cities Mission, supported by Netzerocities. One example is Sweco's partner contribution to Stockholm Climate City For Climate And Health: Capacity to Scale (Scale Stockholm), headed by Charlie, as part of EU Netzerocities. Earlier research includes participatory methodologies for citizen-driven climate transition with a particular interest on social and spatial connectedness in real and virtual space (digital twins and interactive architecture).

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Kathleen Van de Werf is a Civil Engineer - Architect from the Catholic University of Leuven, MA Housing and Urbanism at the AA School of Architecture in London and has been a founding partner of BUUR since 2006. After BUUR was integrated into Sweco Belgium in 2021, Kathleen holds the position of Business Development Manager of the urban planning and environment division BUUR Part of Sweco. Kathleen has successfully managed numerous prestigious and pioneering projects within Flanders, Brussels and internationally, many of which focused on circularity and urban transition. As a Program Director, Kathleen is also a key driver behind the Sustainability Impact Program in Sweco Belgium. A cross-divisional collaboration network that focuses on complex transition themes. Kathleen is a member of the Steering Group of the International knowledge platform Urban Insight and a guest lecturer at the Sustainability Leadership Program of the University of Leuven. Since January 2024, Kathleen has been a member of the Scientific Committee of the recently established Belgian Climate Center.

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As an architect with over twenty years of professional practice, he has been responsible for running and coordinating a wide range of complex overseas design and planning assignments. Carlo has led co-creation processes with transdisciplinary teams across Sweco group to develop innovative models, mixed use greentech, and agrotech clusters which leverage circular supply, value, and food chains to promote resource efficiency and sustainable social and economic development. Carlo has worked in Europe, Africa, Asia, and in the Middle East together with the Ministry of Food Security to develop a special economic zone dedicated to 'Ag-tech', resilience, and food security. He also has extensive work experience delivering urban planning and architectural projects in China. Carlo is adept at developing and implementing holistic solutions with environmental design at the core. The span of work has also included running process leading and stakeholder management workshops utilizing the Symbiocity methodology.

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Architect - Urbanist. Senior Project Leader at Sweco Belgium.

Kevin Penalva Halpin is an architect, graduated in the Architecture School of Barcelona (ETSAB), and holds a Postgraduate Masters in Urbanism and Strategic Planning from the K.U. Leuven, in Belgium. Since 2011 he works for BUUR, now part of Sweco Belgium, one of the leading offices in urbanism in Belgium where he has gathered an extensive experience in the elaboration of integrated spatial development strategies for neighborhoods, cities and regions as well as the design and management of complex urban projects. He has been involved in several circular economy projects commissioned by the Flemish Government and is one of Sweco Belgium's key circular experts.

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Anders Neregård is an experienced architect with over 20 years in the design and construction industry. He has worked on diverse projects, including commercial properties, hotels, and residential buildings, both within and outside of Sweden. Since joining Sweco in 2005, Anders has held various roles, becoming Digitalisation Chief in 2017 and Studio Manager in 2020. He holds a degree from the Royal Institute of Technology and has a keen interest in innovation and digitalisation. His expertise spans all scales and stages of architecture and construction, making him a valuable asset to any project he undertakes.

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Appendices Available Upon Request:

APPENDIX 1.

User Guide & Handover of the Database

APPENDIX 2.

The Questionnaire

APPENDIX 3.

Feedback from Evaluation Workshops