




# Governance of circular economy actions in seven European cities and suggestions for upscaling. CityLoops

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Abstract	<p>The CityLoops project brought together seven European cities to pilot a series of demonstration actions to close the loop of two of the most important waste streams in Europe: Construction and Demolition Waste (CDW), and Bio-waste (BW). Their ultimate aim was to become circular cities in which no resource goes to waste, driving the transition to the circular economy (CE). This report studies the governance by these seven cities – Apeldoorn, Bodø, Mikkeli, Porto, Seville, Høje-Taastrup and Roskilde – for circular handling of BW and CDW. It presents important conclusions of the research, and provides advices for upscaling and adoption of the circularity actions elsewhere.</p>
Keywords	Governance, circular economy, cities, actions
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# 1. Introduction

In this section we introduce the objective of this research presented in this report, its target groups, and the objectives of the CityLoops project and the demonstration actions by the cities in this project. We conclude with the research questions and a short reading guide. But first I would like to express my gratitude to those who supported the research.

## 1.1. Acknowledgements

I am most grateful to the city officers from Apeldoorn, Bodø, Høje-Taastrup, Mikkeli (Xamk and Miksei), Porto, Roskilde and Seville for giving the interviews and discussing the research questions and preliminary results and their encouragement. Nienke Nuesink formerly working at Wageningen Research, now at Rijkswaterstaat, has helped doing some of the interviews and meticulously put the answers in Excell. Charlotte Walther – also from Wageningen Research - has also helped with some interviews and in addition read some of the demonstration reports and shared her observations of which a part is included in the section results per city. Nienke and Charlotte have not been involved in the writing of the report nor read it, and bear no responsibility for the final text. I am grateful for their help and therefore I often use 'we' instead of 'I' as subject in the text.

And finally I express my thanks to ICLEI, Simon Clement and Simon Gresset, for supporting the research with their appreciation. In the Project document the involvement of Wageningen Environmental Research was not specified in detail, and this was not a planned study. It is however complementary to the important work the others were doing in the project and can help CityLoops cities and other cities that want to become more circular to reflect on what to do next. Work package coordinators Edwin Keijzers from Wageningen Food and Biobased Research and Pernille Kernel from the Capital Region of Denmark have encouraged and facilitated this work, which made it much more fun to work on!

## 1.2. Objective and target group of this report

City governments have a role in making economies circular, because of the public interest in resource management. But they also have a role because of the companies and citizens and their organizations within their territory, and who are indispensable for a transition towards CE. Authorities have a governance capacity to facilitate and to guide them.

Across Europe there are many initiatives trying to bring the circular economy (CE) into practice. For actors in city networks it is relevant to know how other cities, like those in the CityLoops project, try to make progress in CE and what their experiences are. And, if cities want to adopt approaches from others, it is important that they understand in which respect their city is similar and where it differs. That enables them to assess which adaptations are necessary in order to be successful in the adoption of the approaches.

The objective of this report is to support cities becoming circular. It aims to present an overview of the factors and means of influence to steer developments towards a circular economy that were present in the seven CityLoops cities. We look into the seven CityLoops cities and their actions for circularity, as if each city is a system existing in social (cultural, political, economic) and physical settings that define how actions for circularity may work out and may in return transform the system towards a CE.

The report is written for experts in cities and CE researchers. Much information derives from the cities.

## 1.3. About the EU CityLoops project and its demonstration actions

Objective of the EU CityLoops project is “To better understand how local governments can best promote the transition to a circular economy (CE) in their city. Closing urban material and resource loops, and thereby reducing the environmental footprint, increasing regenerative capacities, and stimulating new business opportunities.” The circularity approaches of the CityLoops project consist in the – sometimes still experimental - reduction of use of biobased and construction materials and the reuse or recycling of BioWaste (BW) and Construction and Demolition Waste (CDW). Seven cities are partner in the CityLoops project: Apeldoorn (NL), Bodø (NO), Høje-Taastrup (DK), Mikkeli (FIN), Porto (PT), Roskilde (DK) and Sevilla (SP). In the context of the CityLoops project some engage in circularity of both BW and CDW, others in only one of these fields.

Sixteen demonstration actions on CDW were executed by six of the seven CityLoops cities and fourteen BW demonstration actions by four of the seven CityLoops cities (Fig. 1 and 2).

Apeldoorn	Bodo	Høje Taastrup	Mikkeli	Roskilde	Seville
Designing and reconstructing public space in a circular way	Demolish the military airport with circular material management processes	Implementing circularity when selling town hall for demolition	Circular demolition of 2 buildings	Demolition of Hall 11/12 area, preserving the building structure and facilitating reuse of CDW	Renovation of water pipelines with circular material management
	Involve stakeholders and citizens in city development using innovative tools	Høje-Taastrup's New City Hall		Construction of Parking Houses	Optimising clean points
	Embed circular strategies into the planning of a new city district	Taastrupgård		Circular Soil Management	Best Practice Guidelines for CDW Management in Seville
		Recycled sidewalk tile			
		Circular soil management			

Figure 1 -Construction and Demolition Waste demonstration actions per city



Apeldoorn	Mikkeli	Porto	Sevilla
Bokashi production from leaves	Biowaste collection and sorting: pilot project	Biowaste selective collection and local treatment model	Implementation of a biowaste collection route in a neighbourhood of Seville
Biochar production	BW treatment: pilot and laboratory scale experiments	Bio-waste Circularity Models, new CP practices and training courses	Biomethane production from biowaste in co-digestion with sludge
Production fiber based products		Launch of Green Space Certification System	
3D printing organic fibres		Contest Circular Entrepreneurship Initiatives	
Municipal clearing of grass		Reducing food waste by a donation Network	

Figure 2 - BioWaste demonstration actions per city

## 1.4. Research questions and methods

For our research the following **research questions** were formulated.

- 1. What are systemic factors and means of action employed in the demonstration actions that influence the progress in the city<sup>1</sup> of becoming circular? What are possible categorizations of these systemic factors and means of action? How do they influence the impact of the demonstration actions? and what could be done to further progress?**

To try and answer this question we collected data by means of a quick scan (Annex A.3 and A.4), interviews and document study on the social and physical system in the seven CityLoops cities. Results per city (ch.3) were checked by the city officers/ respondents. I used the concept of 'means of influence' for the social context - including the political and cultural subsystems - and briefly looked into the economic and physical (incl. spatial planning) components of the system. I have organized the means of influence per city in a table, and reflect on what may explain the progress. The progress – self assessed by the local officers – is also given.

- 2. How do the CityLoops cities compare and what can we learn from this comparison?**

First I presented all information for the seven cities on the means of influence together in one table, one row for each category of means of influence. This provided a rich overview of possibilities that the cities use to make their city circular, and of the already institutionalized and wider context - in terms of above local influences - that influence the local actions. It is like a benchmark: if you use all these means and good ideas of the cities and CityLoops, you have a strong package to steer towards CE. I assessed the extent to which the various means for each category were present or not (ch.4). Officers were asked to judge this

<sup>1</sup> The term city can be understood in different ways. When the name of the city is used in this report it refers to the city administration and her political body together, or to the city area. Otherwise we specify whether it are officers, the council, the executive board or the public.

assessment. Often progress had been made since the time of interview, and the details that confirmed a more positive assessment were added in the texts and footnotes.

Chronologically this combining of all means of influence per category preceded the organization of the tables for each city separately. However, in the report this comparison follows the descriptions and tables per city.

### **3. What do presence or absence of these means of influence – both the systemic factors and the means of action – mean for upscaling in the city and for adopting the demonstration actions elsewhere by other cities?**

Reflections on the impacts were included in the table per city and discussed or reviewed by the respective city officers and work package lead for BW. And finally I have formulated suggestions for improvement of the approaches at a more general level, that concern any city that wants to adopt the CE actions (ch.5).

## **1.5. Reading guide**

In chapter 2 a very short description of used theory is given. Details about the research methods are presented in the Annex (A1-6). Chapter 3 looks into the situation per city. The tables per city give an overview of strengths and weaknesses per city, in terms of actions and in system. Chapter 4 compares the cities, discusses how they differ but also what we can learn from the comparison for furthering the transition to a CE. It does so per category of influence. Chapter 5 wraps this up in terms of overall suggestions for upscaling and use in other cities. Chapter 6 provides the literature references. It includes policy documents and internet sites from the cities and countries that have been looked into. Also literature is mentioned that was used to explain the choice of theoretical concepts to structure all data in a consistent manner.

## 2. Short theory on system and action

Cities have a certain way of social and physical organization that has an impact on e.g. the demonstration actions and the influence of these actions on the transition towards a CE. Geels (2004) uses the concept of socio-technical (ST) systems: “ST-systems ... consist of artefacts, knowledge, capital, labour, cultural meaning, etc”. Kleefmann (1984) distinguished three social sub-systems as relevant for planning: the cultural, the economic and the political subsystems, where the cultural sub-system is about norms and values, the economic about how we organize the market and, the political about how we govern. And he mentions the physical system, including the human artifacts. Kleefmann (1984), explains the relevance of these system concepts to understanding the interaction of humans with their environment.

A system can be understood as a certain wholeness in terms of matter and being, that functions in a certain way in relation to its surrounding, i.e. it exerts influence on humans and their actions. Transition studies (e.g. Geels 2004, 2011, Smith et al. 2005, Termeer and Metze, 2019) describe how institutionalized or consolidated systems or ‘regimes’ can hinder transitions. The change towards a CE can be understood as such a system transition. In return, to change systems, influence is needed.

In line with Arts & Tatenhove I distinguish four categories of means of influence to analyse both the institutionalized system and the local actions in the cities: the policy content and possibly discursive practices in which actors actively use such policy content to influence others; secondly the ‘resources’ such as knowledge and finances; thirdly, cooperation between parties, and finally: informal and formal rules and legislation. These four categories of means of influence can be relational between actors, also referred as ‘in action’ or ‘in interaction’, trying to influence the social system. Most demonstration actions are of this kind. But the four categories can also concern the institutionalized forms of influence. Arts & Tatenhove (2005) describe these two main orders as ‘relational’ and ‘dispositional’ layers of power. These categories are rather fit for applied research and have been used successfully in other urban management studies and advice (Aalbers and Pauleit, 2011; Aalbers et al., 2015) and in integrated area management study and advice (e.g. Artoli et al. 2021, p7). So in summary:

- The **relational means of influence** which I call ‘**means in action**’ refer to how actors like city officers, politicians, companies, etc. interact with each other and try to influence each other.
- The **dispositional means of influence** refer to the more consolidated or institutionalized social context in terms of long standing policies and programs, resources (e.g. budgets, land resources, expertise) and their distribution; culture and practices, to which the officers and their demonstrations are subjected. Culture and practices are by nature not easily changed. They are sometimes circumnavigated by using ‘pilots’ or – like in the CityLoops project: demonstration actions. Formal legislation is also dispositional. Longstanding institutional cooperations or coalitions are also classified as part of the dispositional layer of power. This study also refers to these as the system or systemic factors.

There are various concept being used in transitions studies, in policy studies and resource or area management. In essence the concepts are quite comparable or complementary. In the cultural, political and economic subsystems that Kleefmann (1988) identified we recognize what is called the 'dispositional layer' of power by Arts and Tatenhove (2005). And culture and informal rules are underlying what Geels and Smith refer to as 'practices'.

Kleefmann's social and physical systems have a fair overlap with the 'socio-technical systems' to which Geels refers. The artifacts form the physical part of the 'landscape level' that Geels specifies as the level that is hard to change. Think for instance of build up areas and road infrastructure. But of course technical systems consist also in technologies used for e.g. processing materials.

The diagram below presents the dispositional situation of cities (such as the cities in CityLoops). Part of the dispositional influence can be put in place by e.g. the higher hierarchical authorities i.e. EU, national, regional or provincial authorities, and by actors such as companies or citizens and their organizations. Finally, local authorities themselves also exert influence by institutions such as local regulations. Together these influences set the context to the demonstration actions (depicted as yellow sun) by the cities and their impact.

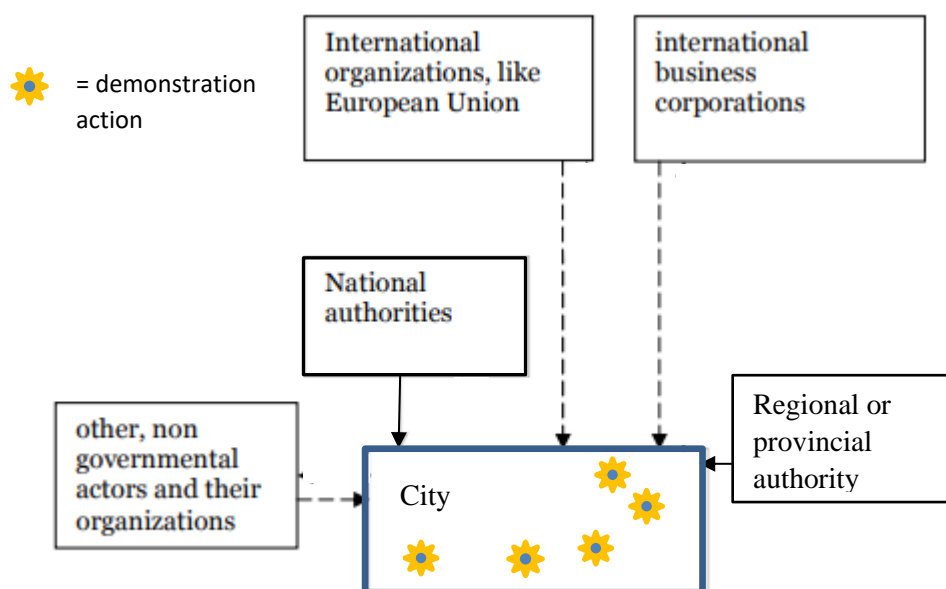


Figure 3 -The external context to local authorities such as cities, also influence the demonstrations (adapted from: Aalbers and Eckerberg, 2011)

## 3. Results per city

### 3.1. Introduction

We identified for the total sample of the seven cities various means of influence for both the dispositional and relational forms. Here they follow:

- *Policy content and if and how this is referred.* Policy is about the substance: what needs to be done (policy targets or objectives) and how? Governments have to choose where to put their public money and human resources. Main ambitions - such as urban growth, but also carbon neutrality - can compete for policy attention with a CE ambition, but may also offer an opportunity for piggyback riding of CE targets on that competing policy. Also, the degree of concreteness in terms of goals, actions, budget and human resources are important for impact of a CE policy. You find also stories and concepts as part of policy.
- *Cooperations*, like the next to types of means of influence, is about the how achieve the policy objectives, i.e. by the parties and their coalitions involved in the CE decision making and demonstrations. In the results per city they are referred in the following order: officers, politicians, citizens, companies. For CE actions, cooperation with other departments is important like for public procurement, but also exchange of insights by experts with politicians, with citizens and companies matter.
- *Resources* put in - like financial and human resources for CE and the capacity and expertise of officers in other departments, to cooperate with, are important. Other resources we refer are land resources, specific data, CE knowledge and tools, and storage facilities. Here we also look into how sometimes officers or politicians find a way around limited policy attention.<sup>2</sup>
- The *rules and regulations* are referred in the following order, and include cultural rules, like valuing CE or not. We use the term awareness and willingness for this.
  - willingness of city politicians to engage in a CE;
  - culture<sup>3</sup> and/or working practices within the offices;
  - ways of decision making by the municipality;
  - willingness of citizens to engage in CE and/or their awareness of a need for CE ;
  - willingness of companies to contribute to the CE and/or their awareness of a need for CE; and
  - relevant formal rules and regulations at local or higher level.

Ways of decision making (see the above list) also influence outcomes, e.g. because insights from different parties lead to different understanding and solutions. N.B. with the term decision **making** we include consultations that proceed the taking of decisions. Decision making goes from initiative to approval by councils. Compared to decision making, decision **taking** is only the last phase of deciding what to do, e.g. whether to adopt or reject a policy,

<sup>2</sup> Sections 3.1.2-8 combine the answers to the interview questions 2- 8 and 12-15.

<sup>3</sup> Culture is about common rules that a group of people shares about what matters, how to behave, etc. Sometimes these are also laid down in legislation. Rules differ between cultural groups.

to do or not do a project, to accept or not a regulation. Four types of decision making were suggested in the question to the respondent. These four ways are: top down and very political; knowledge based, sensitive to facts and figures; decision making in consultation with residents and/ or companies; decision making focusing on efficiency<sup>4</sup>. These types can co-exist, e.g. some decisions may be top down and political, whereas other decisions may be based on facts and figures or on consultations with citizens or companies.

Concerning rules and regulations: The EU Waste Framework Directive from 2015 sets targets for all Member States by 2020, the preparing for re-use and the recycling of waste materials (such as paper, metal, plastic and glass) from households shall be increased to a minimum of overall 50 % by weight; By 2025, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 55 %, 60% and 65% by weight by 2025, 2030 and 2035 respectively; 70% weight CDW reuse, recycling or other material recovery for 2020.

In 3.2 -3.8 we present the gathered information per city in alphabetical order, categorizing the information per means of influence. We include descriptions on the progress towards CE, on the economic and physical context.

### *Progress in the city*

The respondents were also asked about their city's progress towards circularity (interview question 3). We used the following ranking: 1 = *at the very start* ; 5 *on the way to and made substantial progress*; 10 = *circular*. It are mostly arbitrary assessments that are given, not based on calculations, with the exception for Roskilde. And they often consider only the actions of the officers and not of citizens and companies. The progress can be considered as a context to the demonstration actions, but also as system change resulting from the demonstration actions and other circularity actions so far.

### *Tables*

At the end of each after each description of the city context, a table gives an overview of and tries to answer the research question on coherences between the systemic factors and the impact of actions, and vice versa: the transition of the system into CE.

N.B. The results and tables include the statements of the local respondents and results from the literature study (see chapter 2). So it is a mixed material that combines practitioners' and researchers' understanding of policy documentation and theory. Results per city, and content and scores in the tables were discussed with and agreed by the practitioners, only the Mikkeli description in section 3.5 and the description of the economic context in Bodø have not been read by them.

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<sup>4</sup>..with a new public management (NPM) attitude, understood here as getting things done quickly by avoiding bureaucracy and at low costs and/or by outsourcing. See e.g. Kaboolian, 1998



## 3.2. Apeldoorn



Figure 4 - City of Apeldoorn (photo: Apeldoorn municipality)

### 3.2.1. Political and policy context Apeldoorn

#### 1. Policy content Apeldoorn

The DNA of Apeldoorn is represented by the green leaf, the logo of the city, the respondents say. 'Apeldoorn 2040' is the central policy, supported by the Environment Vision ('Omgevingsvisie'). In the Netherlands, the Environment Vision ('Omgevingsvisie') is an obligatory document. "It describes in main lines the quality of the physical living environment (what is there and what is its quality); the intended development, the use, the management, the protection and the preservation of the territory (what is happening/will happen to developments and conservation of the territory); and the main issues of the integrated policy to be implemented for the physical living environment (what are the goals to be pursued and how are they achieved)" (VNG, 2023 (own translation)).

Apeldoorn 2040 is oriented towards growth and construction of housing because the city council wants to grow from 160.000 to 180.000 inhabitants, in line with the national growth (p.4). The supporting infrastructure for that is also on the list of policy ambitions. Reading the 11 pager 'Apeldoorn 2040' we find that full circularity and climate neutrality of Apeldoorn are mentioned as 'speaking for itself' but in contrast to other objectives this is not elaborated any further in this central policy of Apeldoorn. According to the respondents, on a next and lower level is the energy transition ambition. Thirdly come the social ambitions such as inclusiveness, framed as 'social power' in the 'Apeldoorn 2040' policy. According to the demonstration report an 80 ha increase of business park is also foreseen.

Literature study shows that the Energy-transition program 2023-2030 mentions circularity a few times between the lines in relation to awareness raising at the level of citizens and companies, and in relation to public procurement. In the 'Koersdocument' for the Environment Vision among many objectives a main objective is the reduction of the use of

raw materials in Apeldoorn with 25%. The Koersdocument refers to actions such as circular procurement, building, business, agriculture and recreation, while involving companies (p.47).

In the mentioned Environment Vision circularity is specified in terms of reduction of the amount of not yet separated household waste to 30 kg/year/person; 25% circular public procurement in 2023; and a big share of wood in construction in 2040 from preferably local growth.

The assessment framework ('Beoordelingskader') for spatial initiatives says that circularity is only to be taken into account as a basis, i.e. legally. But legally there is not much, the respondents say. However, the Apeldoorn 2040 document states between the lines, that Apeldoorn will be circular in 2040. Apeldoorn has no policy document specifically for CE development.

The 'Kansenkaart' Apeldoorn (K+V 2018) identifies 8 chances for CE actions by the city. It refers to the importance of internal communication between the department for management of public space (this department commissioned the study) and the communication department of the municipality for taking chances in CE. In another document, the 'Uitvoeringsagenda energie transitie 2017-2020', the policy objectives in the various policy documents by the council are also elaborated in terms of projects, such as climate neutrality projects.

According to the respondents, Dutch policy is considered to be a cause of limited attention in Apeldoorn politics to CE. They find that Dutch policy it is not outspoken in terms of CE ambitions. There is less policy attention to CE than to the energy transition. It is not much, compared to 1,5 billion euros nationwide for the energy transition and a similar amount for national housing. The respondents consider both factors to be the reason for Apeldoorn still being at the very beginning of the process towards circularity.

In the provincial Environment Vision (2018) we find CE policy ambitions that include the Cleantech Region of which Apeldoorn is part. The Apeldoorn officer states that it has been decided by the city that the Cleantec region concept will no longer be used. The region is now called the city-triangle (Stedendriehoek).

The fact that the Apeldoorn 2040 document states between the lines, that Apeldoorn will be circular in 2040 was used by the alderman as crochet, as point of reference, for asking and receiving budget for a circularity moderator for two years. The budget was made available and the moderator ('kwartiermaker' in Dutch) established a circular 'cooking book' showing circular possibilities. The book was offered to the executive office, together with a letter to the City Council. 1 October this function comes to an end.

Four BioWaste and CDW demonstration actions have been executed in Apeldoorn. The Bokashi demonstration is about adopting a fermentation process that converts leaves from trees from Apeldoorn's public space into a soil amendment which adds nutrients and improves soil texture. Then there was the desktop study about Biochar and some tests with it that Apeldoorn executed, mainly to inform about the possibilities to use biochar. The third demonstration was about fibre-based products from grass. Apeldoorn, the Middle Mill museum and Wageningen Research made paper with grass. And the fourth BioWaste demo was about the use of the invasive and harmful Japanese Knotweed plant as a resource to make filament for 3D printing. They 3D printed colourful hedgehogs with the filament, that could serve as a gift or press papier.



The CDW demonstration was about a residential road renovation project in an Apeldoorn neighbourhood. It included a public procurement approach to stimulate circular handling of CDW and the reuse of bricks for paving parking places. In this project for the first time a cooperation between contractor and city office was organized to accelerate the work, the so-called 'building team'.



*Figure 5 - Demonstration of printing with 3D printing filament from Japanese Knotweed in CODA Experience Lab, Apeldoorn (photo: CityLoops)*

## 2. Cooperations/parties involved in decision making and demonstrations

An obstacle the respondents refer to is that in comparison to citizens and companies, city officers do not have direct access to politicians for exchange of ideas. The administrative layers in between are discouraging this.

In Apeldoorn's demonstrations there was a moderate involvement of citizens. Apeldoorn is considered a service city, meaning that the city rather approaches citizens as clients than as partners for cooperation. Apeldoorn offices still think about informing citizens, but not about involving citizens. In Apeldoorn on social media some reactions came in after the spreading of bokashi, especially related to the smell. The reactions ranged from laughing (according to the interviewee) to complaints (information regular meeting with Apeldoorn officers in 2023). There wasn't much discussion about applying Bokashi or not. At the time of the interview there was not yet a communication officer involved in the project. In the Koersdocument involvement of citizens and companies is however mentioned for CE activities by the Municipality of Apeldoorn.

As concerns working with companies, the small company 'Bij de Oorsprong' exchanges thoughts with the municipal officer on the soil quality management with Bokashi and is hired to treat the Bokashi mechanically. Possibly the notion of CE is less the issue the company is thinking of. Also Wageningen University and Research, internal stakeholders within the municipality and the Dutch consortium on Circulair Terreinbeheer (circular land management) cooperated in this demonstration. In the other demonstration – making paper from grass - the old paper mill (now an association) was involved, hired by the research

institute. In the biochar demo a specialized company from Germany, the municipality of Enschede, Wageningen University and Research and expert Peter Pannekoek were involved. The expected costs for the municipality to obtain the raw material for biochar is assessed at 15 million a year. At the current stage, the dependency on biochar is completely with the market. As comes to 3D fiber printing involved stakeholders were Wageningen University and Research who produced and who together with CODA and New Tech Park tested the filament for 3D printing. This was all with the aim to learn, rather than to sell (Hellemans et al. 2023). There is interest from several stakeholders in using the type of filament produced in 3D printing. Next step in the developing the demonstration towards a commercial process is to acquire interest from industrial partners.

Also with regard to the demonstration action on CDW in renovation of a residential street, the client-provider relationship prevails. The contractor for this project was found through tendering. In the public procurement the municipality added the requirement the contractors to suggest ideas on how the contractor wants to close material loops and reduce the environmental impact of the project. In contrast to the common practice for tendering buildings, now the demolition, site preparation and building activities were tendered together in one tender and granted to only one contractor.

Apeldoorn is not used to exchanging ideas with companies about circular practices, the respondents say. In Apeldoorn public-private partnerships are not common and not a part of the culture of the municipality. There is cooperation with the market in many areas. For example, one project leader cooperates with knowledge institute TNO and builder Vermeer to put sensors in asphalt, for the data GBI they work intensively with Antea, another project leader works together with a company to draw up a materials passports, etc. However, often the cooperation is cast in a customer-supplier relationship and not in a shared responsibility cooperation. The client-provider relations dominate the way the municipality interacts with companies, the respondents say. They mention the coincidences linked to the cooperations. Certain companies in the cities are part of networks and have connections and business relations that contribute to exchanges: WENL Head Office, Foenix, which is a circular handcraft company, Circulus (public company) which collects waste on behalf of Apeldoorn and other municipalities. Networks also contribute to raising ideas and influence decision making by companies. One of the main learnings according to the demonstration manager in Apeldoorn was that it is advisable to gather information from specialist/experts before starting a process like e.g. grass production from paper. Because it seemed quite simple, but at the end it was a difficult process (Hellemans and Keijzers, 2023).

According to the BW demonstration report, the municipality of Apeldoorn initiated three CE related knowledge campaigns targeting residents, external and internal stakeholders. The campaigns used different communication channels: workshop, social media, Collaborative Learning Network meetings and site visits. About 2800 persons have been reached for the various demonstrations together, by means of 14 communication measures such as press releases, websites, events, social media and media articles. By means of a video Apeldoorn now also wants to inspire people that you can do a lot with natural products. (Hellemans et al., 2023).

The CityLoops officers in Apeldoorn did not really involve citizens nor companies in the early stage of the demonstrations. (WP3 work session Jan.23) During the course of the CityLoops project we find however that there are several small actions by NGOs that are financed by the municipality.

### 3. Resources (and potentially competing policies)

In Apeldoorn's budget for 2023 15 million euros are budgeted for waste and environmental management out of a total budget of 705 million euros - of which 463 million euros is paid by the national government (Apeldoorn 2023, infographic). The respondents say there is no adequate budget earmarked for the circularity actions. The existing sectoral departments are in charge of the operational tasks. They can act on for instance household waste, even without extra funds. But, for example, for the circular management of the real estate portfolio this is completely different. You then have to deal with all kinds of budget constraints, while there is no money for circular management. If money has to be added for CE, the project will die, the respondents say.

In terms of human resources: it is thought that the group that runs the demonstrations is too small (work session Jan. 2023). During the quick scan the officers mentioned that they are stimulated to cooperate with other city departments, only if this is foreseen in the yearly budget.

In terms of use of technical tools and automatization the demonstration report on CDW in Apeldoorn gives insights into the degree of digitalization and automatization of data collection on the status of roads. There is a digital asset management software that stores data about material and quality used in for example streets. Up until the demonstration action non-automated visual inspection was done to assess the quality of the assets.

The municipality of Apeldoorn plays a role itself in the storing of CDW and facilitates finding a new destination for it. Apeldoorn has had a depot for soil and sand for several decades. They have plans to add a physical depot for other building materials as well to stimulate the use of used products in their own construction and renovation works. The municipality considers opening a second location. In addition, the municipality now collaborates with DuSpot, an online matching tool for used civil construction materials. Ideally, the physical depot is equipped with an automated system and digital infrastructure that directly feeds into a material database, knowing which materials are available where, and at what quality and quantity should make it easier to match supply and demand.

### 4. Formal and informal rules, and regulations:

Willingness at the level of the city council to render the city a circular city, is not very manifest in Apeldoorn. Neither do members of the city council raise questions concerning circularity. Other issues, like housing, are given priority. One of the respondents would like more interaction on circular actions with the council. According to the quick scan in 2021 politics that are in the way of Apeldoorn becoming a circular city. The former member of the governing body of the city had ambitions in terms of CE. With the division of his portfolio over three other members, CE is no longer an outspoken political ambition, the respondents say. The demonstration manager finds that it helps if politicians are on board (WP3 work session Jan.23).

Between departments the degree of innovative culture is considered to differ. The municipal section for management of public green space is experimenting with the use of bokashi and tree stumps, e.g. in sound barriers along roads, to see how it works. But more generally the

municipal culture is considered rather conservative. Innovations depend on external funds, which is an indication of a conservative attitude. It is not in the 'genes' of the municipality to be very innovative, the respondents say.

Concerning the ways of decision making, we learn from the respondents that e.g. for engaging in the proposal for the CityLoops project it all started with the initiative of a project officer. The project officer presented the project idea to the council for approval. And later on the concepts for the demonstrations were conceived by the officers and proposed to the responsible member of the governing body for approval. The Bokashi pilot is an exception: the pilot and the amount of leaves involved were initially approved by the council.

For construction and demolition waste, decision taking happened by the head of the department of public works who commissioned the works. There is a big difference between the CDW and bokashi on the one hand, and the other biowaste demonstrations that are small and experimental and without embedding in any formal policy ambition or organization.

In response to the question about the character of decision making we hear that decision making in Apeldoorn offices and about policy is generally not 'top down and political'. Facts and figures, and knowledge are found important for taking a decision. But sometimes (Work session January 2023) hypes and trends and the order of the day lead to spontaneous, not well considered decisions. Also the quick scan and the demonstration report mention the strong degree of action following trends, over-ambitiousness and lack of sufficient basis in facts and figures, while reacting to the order of the day. And the kind of decision making depends a lot on the issue. There is sensitivity to views of residents and companies, for example when concerning housing decisions or the economy, e.g. the executive board member for the economy portfolio was said to be sensitive to the lobby of companies. But this is not the case when it concerns circularity! As already referred earlier Apeldoorn is rather approaches citizens as clients than as partners for cooperation. Apeldoorn offices still think about informing citizens, but not about involving citizens.

In the course of 2022 and 2023 we observed that the CityLoops officers however started to get more into touch with companies in the context of the Collaborative Learning Network of CityLoops. A first new approach for the municipality was to align stakeholders in a co-design process with a focus on closing material loops. Traditionally, these residential road renovation design processes are done internally. By letting external stakeholders participate early in the design process, in a so called 'process journey', facilitated by Koos Service Design, an increased awareness and knowledge amongst the different stakeholders on roles, tasks and perspectives was noted. By bringing these stakeholders together in one group, awareness was increased on the cross-connections in the project. Ideas to improve circularity were generated and many were implemented (Hellemans et al. 2023 section 4.1.1).

For waste issues, the character of decision making, efficiency and costs are important as well as the facts and figures! This is because costs are directly charged to inhabitants.

The respondents mention a number of local initiatives in which citizens are very active: e.g. Zero Waste Apeldoorn, focusing waste prevention and keeping clean. Then there's Apeldoorn Repairs, with a number of repair cafes. It is a group that has the intrinsic motivation to contribute to the CE and therefore deserves to be mentioned, the respondents say.

Willingness companies We have limited information concerning this issue, only derived from some interviews of officers in Apeldoorn region of two public-owned companies OVIJ (Environmental Services) and Circulus Berkel (Waste company) both owned by municipalities including Apeldoorn); from the semi-public organization State Forest Service (SBB), the subsidized Stadsakkers, and the Cleantec Region which is a network run by a company. Notion of circularity was rather well developed among most of these parties and they all seem relevant and willing to cooperate with in terms of CE or specific demonstrations. For example for Biochar there was interest with at the level of Circulus and SBB. For Bokashi with Stadsakkers. They brought up also other CE ideas and see numerous roles for the municipality in the process towards becoming a circular city.

'Legally there is not much' in Apeldoorn that supports CE actions, the respondents say. Apeldoorn's Bokashi demonstration is in fact legally not yet allowed [because it transports what is formally considered to be waste.] For the other demonstrations there are no legal barriers. By law it is forbidden to work waste of third parties. That also concerns grass mown from verges and Japanese knotweed. Legislation hinders the movement from waste into resource. And the national government as legislator is aware of this. See for example, the National Waste Plan that needs to be turned into a resource material plan. There is need for more possibilities to (re)use waste. Some very risky substances are behind the existence of the present legislation and it requires due consideration. Also the reuse of textiles as insulation materials is facing this legislative barrier. Rules and regulations in the municipality narrowly define the handling of household waste and doesn't leave much room for changing practices. The choice for green waste from public space as demonstration issue came forth from the fact that for choices regarding the handling green waste from public space there is legally more room. The Green Management office could decide more independently.

In terms of rules regarding the supplier of concrete products, in the demonstration action the municipality had an agreement with a specific supplier which was laid down in a framework contract. This contract described the terms and conditions of an ongoing business relationship between the supplier and the municipality. Possibly this agreement is terminated in spring 2023 and replaced by a set of specifications applicable to new renovation and building projects. These include for example a requirement of min. 15% secondary aggregate in above ground concrete products and quality standards for the used aggregates.

Literature shows that the National Waste Plan (LAP) will be succeeded by the Circular Materials Plan (CMP), possibly 1 January 2025. With the CMP, the government aims to tailor the current LAP more to the transition to a circular economy. The national KIA CE (knowledge and innovation agenda for the CE) states that at the current speed, set targets will not be reached, upscaling is needed, acceleration, and more attention to valorisation, market creation and impact (Ministerie van Infrastructuur en Waterstaat en Topsector Chemie, 2023, p.2). Dutch government collaborates with companies to develop CE policy, like on the national KIA CE.



### 3.2.2. Progress towards circular city in Apeldoorn

Apeldoorn respondents self assess to be still at the beginning of becoming a Circular city (1-2). The officer explains this by the change of responsible member of the governing body and some hiding behind not very outspoken national policy attention to CE. As concerns facts and figures, the officers have learned from the demonstrations. The facts and data enable them to ask the market to improve. Another main learning is that before starting a project you should have a long term vision for the project, a better insight in the people with whom you should do the project within and outside the city offices, what the financial costs and benefits are, and the environmental ones.

### 3.2.3. Economic context Apeldoorn

Central question concerning the economic context were about what the current financial position of the city is, whether the local economy is growing, shrinking economy or stable. Another question was whether this financial position influences the implementation of the CityLoops demonstrations in the city?

The city of Apeldoorn wants to invest and has the potential to grow, in terms of housing and energy. The budget comes from the national state and in second order of budget from local taxes, like on real estate, on waste. Especially in the social domain it is not much, they have less problems in social housing areas than the bigger cities have. And Apeldoorn is thrifty with its budget. The financial situation does not play on the demonstration actions. The Bokashi demonstration is expected not to cost a lot more than the former way of soil management. For the latter they had to buy artificial fertilizer and to pay the transport of leaves to the composting plant for which the municipality has to pay a fee as well. The mechanical treatment of the leaves and the terrain needed for storage of the Bokashi mixture bring some costs with it as well. The management department can bear the costs involved. During the quick scan the officers referred to the fact the the city owns much of the land so it can manage and decide rather independently on the BioWaste demonstration actions. The high quality and maintenance level of materials and real estate also help the demonstration actions.

### 3.2.4. Physical context and spatial planning Apeldoorn

Apeldoorn is a large municipality with lots of greenspace. According to the respondents, the physical situation was influential, e.g. for the Bokashi demonstration. Bokashi production started in the Berg en Bos district with its parks, because of the good quality of the leaves there: they are clean. The district holds public areas where the city could harvest about 1000-1500 tons of good leaf waste. For biochar there were similar concerns. Meanwhile Japanese knotweed has spread to over 500 sites in the city and the officers expect that the national highway will offer best site for its collection in due time. And for making paper, it will

probably again be the verges from green districts like Berg en Bos from which the city can collect the best quality grass. For reuse of CDW it are rather the districts from the 70-ties where lots of tiles are used in the public space where playing outside and traffic use the same extensively paved spaces.

APELDOORN								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>5</sup>	Concrete elaboration <sup>6</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>7</sup>			
	..8	+9	+10	..+11	++			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	..+12	..+13	..+14	..+15	+16			
Resources	Capacity municipal officers towards CE <sup>17</sup>	Use of automated data generation CE <sup>18</sup>	Other tools <sup>19</sup>	Financial resources	Storage facility <sup>20</sup>			
	+	..+	..+21	+22	..+			
Formal and informal rules	Political willingness (council, exec. Board)	Willingness in city offices	Use public procurement to promote CE <sup>23</sup>	Local regulations <sup>24</sup>	Nat. legislation <sup>25</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>26</sup>
	..+27, 28	..+29	+30	-	..+31	Hierarchical <sup>32</sup>	..+	+
Economic context	Economic growth and municipality choses to follow Dutch population growth scenario, meaning +20, 000 population.							
Physical context	General presence of greenspace, not a dense city, 160,000 inhabitants, moderate climate							
HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS? WHAT COULD BE DONE TO FURTHER PROGRESS								
In general: Not yet adequate institutionalization. Elaboration of time horizon of policy targets and actions is not yet adequate. National and local formal rules and regulations and informal rules need attention. Few political steps towards CE. Together these make that there's some but rather limited progress towards CE, even though small citizens initiatives and some awareness among companies exist.								

<sup>5</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>6</sup> Of CE policy or carbon neutrality policy

<sup>7</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics (++) , putting CE to the background

<sup>8</sup> 'Koersdocument 2030' mentions 'circular', but it is a big container document...

<sup>9</sup> Energy transition 2023-2030 policy mentions circularity a few times. Koersdocument 2030 names energy neutrality for 2050 (p.43)

<sup>10</sup> 25 % reduction raw material use (no time horizon), 30 kg/year/person residual waste in 2025 (before 2030 in 'Woest aantrekkelijk', 'afvalbeleidsplan', more wood construction 2040, 2023 25% of procurement (in euros) is circular ('Woest aantrekkelijk', only refers national targets: in 2030 use abiotic minerals, metals and fossile resources is halved. 2021 waste selection 75%, no more complete disapproval of resources).

<sup>11</sup> Companies mentioned in the Koersdocument, but their roles are not defined

<sup>12</sup> It is growing, e.g. with climate, green management department, communication officers are investing in this. But work installed moderator (kwartiermaker) ends 30 Sept. 2023

<sup>13</sup> Rare, focuses reduction of waste

<sup>14</sup> Client server relation, some cooperation with small civic society organizations (CSOs) in the demos

<sup>15</sup> A building team was organized for consultation between municipal officers and builders about possibilities for circularity CDW. E.g. covenant BAM Infra But in general relation with companies is rather a service relation.

<sup>16</sup> TNO, WUR, Saxion

<sup>17</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>18</sup> Data that are uploaded into a digital system and processed and of use to various CE actions, including monitoring and evaluation

<sup>19</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>20</sup> There are few storage facilities, e.g. along the highway for CDW.

<sup>21</sup> Circulus as semi-public company manages facts and figures of waste and its management and costs in Apeldoorn. LMA (National Reporting point Waste) is too much focused waste registration, and not prevention (A.H. 25 Sep 23). Apeldoorn has access to this system, but it is not optimally used.

<sup>22</sup> Serious concerns for the future finances of cities (VNG 'ravijn')

<sup>23</sup> Referring structural use only, so not if only in the demonstrations

<sup>24</sup> Does the city or region make use of local regulations to support CE?

<sup>25</sup> Is there specific national legislation that supports or facilitates local CE policies or actions? E.g. end of waste crit.; strategy green CE, public role waste

<sup>26</sup> Different from willingness which means going into action as well!

<sup>27</sup> Weak, but at present a new member of the governing body is again pushing CE since the recent municipal elections in 2022

<sup>28</sup> Also explained by limited national policy attention to CE if compared to the energy transition

<sup>29</sup> Possibly furthered by instalment and work of the moderator ('kwartiermaker')

<sup>30</sup> Recently the manifest for MVO (social responsibility in procurement) has been signed, includes CE

<sup>31</sup> In the process, still weak according to the respondents.

<sup>32</sup> Though influence by companies on decision making is referred incidentally

<p>Look into board from Porto in which companies and citizens are consulted, which can help innovate. National legislation (NGP) could be strengthened to support progress towards CE<sup>33</sup> and learning from e.g. Danish legislation on procurement and end of waste criteria as well. Important to institutionalize inter office cooperation /especially now that work of the moderator on CE ends in September 2023. E.g. look into example of interdepartmental groups Bodø or interoffice sustainability groups Høje-Taastrup and Roskilde. A pity that the moderator (kwartiermaker) position has only been created for a short period and ended already in September.</p> <p>Limited use of data tools limits the possibility to monitor and evaluate and make decisions based on facts and figures.</p> <p>General presence of greenspace is supportive to the BW demos and was a reason for their choice. Construction of housing for extra population following the compact city paradigm may limit BW circularity options due limited material production area and limited space for storage. Use this growth ambition to leverage CE at the same time (piggyback riding). Advice to preserve sufficient open spaces, e.g. for storage of materials but also in the wider region for production of biogene materials. At present much space is being used for feed production (info Keijzers).</p>	
<b>Demo: Designing and reconstructing public space in a circular way</b>	Limited collaboration limits tapping into societal capacity to make the turn towards circular CDW actions. The economic situation would allow better performance, as well as the physical context. Try and use possibilities for piggyback riding on Apeldoorn 2040 growth plans and institutionalization of CE requirements in procurement policy (see how Bodø did this for new district). Setting clear and ambitious targets and engaging in dialogue with the building sector on ways to do so, is advisable if the city wants to progress in CE.
<b>Demo: Bokashi production from leaves</b>	Climate conditions support the fermenting of leaves into Bokashi which requires sufficiently high temperatures. Limited cooperation with companies limits possibilities for tendering Bokashi production and its innovation. Cooperation with experts may help identify options to reduce CO2 emissions mechanical turning Bokashi. Cooperation with citizens and companies might help identify manners to upscale city wide, if ecologically desirable. Awaited outcomes of national Bokashi research are important to help decide.
<b>Demo: Biochar production</b>	Limited cooperation with companies and semi-public companies limits the perspective on options for production and use of biochar in Apeldoorn for CE by the market. Fact and figures ecological implications may be needed.
<b>Demo: Production fibre based products/3D printing</b>	Possibility to tap further into companies' capacity to produce filament and into local citizens initiative (NGOs) to unroll local, small scale use of filament in 3D printing. Possibly potential for small entrepreneurship selling 3D prints.
<b>Demo: Grass to paper</b>	Lack of interest of big companies limits upscaling of this innovation.

*Table 1- Context, circularity demonstration actions and suggestions for Apeldoorn*

<sup>33</sup> Recent national study commissioned by RWS was delivered by TU Delft as input to national material plan (NLG)



### 3.3. Bodø



Figure 6 - airport area where new district will be developed (photo: Bodø municipality)

#### 3.3.1. Political and policy context Bodø

##### 1. Policy content Bodø

The Bodø city council finds it of key importance to keep the city attractive for its inhabitants, especially for young people from 20-40 years. Quality of life, employment and recreation for especially these young people are policy objectives. Also, by 2050 Bodø wants to be "a low emissions society" and by 2030 it wants to attain 70% of reuse of household waste and waste from businesses (excluding soil), compared to 2009. This objective was defined in 2018, but was published in Klima- og energiplan 2019 - 2031. More sustainable practices, like in terms of mobility and reduction of the transport of people, goods, materials and masses, including thinking in more circular ways, the respondent says. These policy objectives are somehow related to CE since the city looks for ways to re-use buildings and does this by identifying how unused buildings can be used for social purposes.

A second important policy ambition of Bodø city council is the development of the civil airport project in a sustainable and circular way on the site of a formerly military airport. The ambition is to do this both in a circular and socially sustainable way. Third, this is combined with goals in terms of markets for re-use in order to generate workplaces. In its overall environmental plan Bodø has a set of goals related to circular economy.

Bodø is now demonstrating in the business model activities in CityLoops the advantages of CE. The municipal officer wants to showcase how CE might be economically beneficial. That might enable the municipality to push companies further. Bodø municipality thinks that using procurement as a strategic tool is the way to go.

The ambition is to establish a digital database that matches supply and demand for CDW and thus creates a market. This includes an overview of future projects, e.g. information on where and when soil will come free from building projects so that other projects can take these materials into account in their planning. “Optimal utilization follows the waste hierarchy (reduce, reuse at site, high quality reuse in other project or agriculture, low quality reuse in other projects, backfilling, landfilling)” (Kristenssen et al. 2023).

Ideally the marketplace allows direct contact between projects so that transfer of materials can be easily arranged. Also, the respondent says, a reasoning that causes an impact is needed, like that we have to stay within the 1.5 degrees temperature increase, the carbon footprint. The officer sees that in construction projects they just crush the houses or structures to move them to a waste management facility and re-use it as fillings. That is not upcycling. They want to use concrete elements and use them in new structures. If it are concrete panels it would still be considered as waste.

From the demonstration report we learn that “CityLoops is involved in a crucial time for the huge city development project in Bodø as environmental policies are being set and politically manifested now. In relation to that, a politically approved overall environmental program is prepared. This program is divided into four categories: nature conservation, mass handling, circular treatment of materials, and energy efficiency.

The municipality also started working on a municipal soil strategy and on improved soil and material management and circular material use. This includes for example principles of efficient resource use, minimal emissions and a good overview of where soil is used and what for.

According to the respondent, during the CityLoops project the municipality of Bodø has developed a new procurement strategy and guidelines, including circular principles. We could not find anything on the actual criteria though. The strategy has formally been accepted by the city council. In the Klimabudsjett we read that Bodø commands policy implementation by requiring from departments to report on climate actions in the same way they report on financial expenditures. The emission reduction target concerns direct CO<sub>2</sub> emissions within the city’s boundaries, in accordance with the national environment agency’s guidelines.

Demonstration 1 was about reducing demolitions and waste as much as possible by renovating and repurposing buildings, integrating circular thinking into procurement and embed circular and sustainable practices in the demolishing strategy in the New Airport / New City project. Linked to this is the second demonstration about engaging the main actors in the transformation of the airport and the new city in a dialogue from the beginning: the military, Avinor airport, the municipality and the large citizens interest group. The third demonstration focuses the internal processes and plans within Bodø municipality for circular city planning. In this demonstration the tools and concepts developed in CityLoops are used (Kristinsen et al. 2023).

## 2 Cooperations/involved parties

From the demonstration report on CDW-projects we learn that in Bodø internal, cross-departmental groups on circular soil management, circular procurement and circular

construction have been established as a result of CityLoops. Their internal cooperation within municipal departments in view of CO2 emission reduction is referred.

Bodø facilitates a local circular ecosystem that consists of companies, societal organizations, research entities and public actors. Organizing various events for these stakeholders is part of their strategy to build that ecosystem. The respondent says that relations and networks need to be created for more impact. It was also said that the engagement of citizens and organization, helped the demonstrations.

CityLoops has been the work leader for preparing the mass handling-category but has also been a substantial contributor in the circular treatment of materials-category", the report says. In Bodø companies are involved to a high degree through the procurement in CityLoops. They are informed about the changes in procurement of services and goods by the municipality.

In the demonstration report on CDW it is stated that Bodø municipality actively involves with private companies and organizes events to engage with them. For example they organized a material reuse event. Part of it was a workshop in which they gained insight into the current mindset of the sector regarding circularity, current initiatives and to stimulate discussion between sector parties. Another example is a procurement workshop with various public and private actors to generate input for the city's new procurement strategy.

Bodø municipality has the ambition to set up a marketplace for reused materials. It is difficult to realize this as a municipality, because Norwegian law hinders municipalities in interfering with competitive advantage. In this case a municipal market place can be considered a subsidized competitor to established material retailers. The local waste company, of which several municipalities are the shareholders, is willing to set up such a physical market place in combination with a digital database. A small-scale market place has been opened in early 2023. Presently, only a few building projects cooperate, but there are plans to slowly scale up the location as the number of projects grows.

From a short visit to the website of the municipality of Bodø the authors of this report get the impression that the communication of the city focuses on the needs of the citizens or companies that search for practical information. Even with basic command of the Norwegian language the information is easy to find and practical, although the CE has no prominent spot in the menu of the website.

Citizens involvement in the demonstrations is in a pilot phase in Bodø. It needs to be better implemented and to become part of day-to-day practice. They for example involved the citizens in the development of the new city district through various events and campaigns about the design and potential solutions for the new district. In addition they made use of 3D-visualizations and the computer game Minecraft (Kristenssen et al. 2023). The officer also thinks they need to be better at taking seriously the inputs from the arrangements for citizens involvement. The involvement of citizens is formally in the arrangements with CityLoops but it is not obvious whether it works.

According to the respondent, the largest sources of emissions in Bodø municipality are shipping, construction and road traffic. The city acknowledges the importance of action by other stakeholders. The cooperation that might be required for this was not made explicit in the Klimabudsjett.

### 3 Resources

In Bodø the present situation is financially unstable, so efficiency now is very important for decision taking. That might compromise the ability to involve stakeholders and citizens. In terms of Human Resources there's lack of knowledge on these matters, and on technical possibilities for the reuse of different materials. During the quick scan it was mentioned that the knowledge and competence from local partners NRI and IRIS was helping the demonstration actions. Technical solutions, such as the life cycle analysis and the 3D tool, also help to make data based decisions. What should change is that more knowledge is needed, more education for raising awareness and understanding. E.g. in relation to the polluted soil in Bodø (see physical context below) the municipal soil management group suggests a municipal soil strategy, including a strong human resource component: "Bodø municipality shall be experts on optimal utilization of the soil typically found in Bodø." (Kristenssen et al., 2023)

In the demonstration report of Bodø different (digital) tools that support decision-making, collection of data and visualization of data and options/scenarios take prominent position. Technology has to be further developed, though. The report also underlines that the importance of these "various tools tailored for specific activities is a crucial factor in enhancing the efficiency and effectiveness of processes. These advancements have resulted in the creation of multiple tools that aid decision makers in making well-informed decisions grounded in high-quality data." An example of these tools is a digital twin of Bodø that can be used in various settings, the material stream analysis and material mapping. Both help to identify possible new applications for CDW alongside with determining the quality of the materials. The municipality is working on incorporation of a soil prediction tool from a company called Material Mapper as part of the mass handling management strategy. Their predictions have a high uncertainty, though, because timelines of the planned construction work constantly change and the soil contamination in the city is not accurately taken into account. The programme offers a better visualization than the city planners use now though and has more functionalities. For example they also can estimate waste and material use from planned construction projects. (Kristensen et al. 2023).

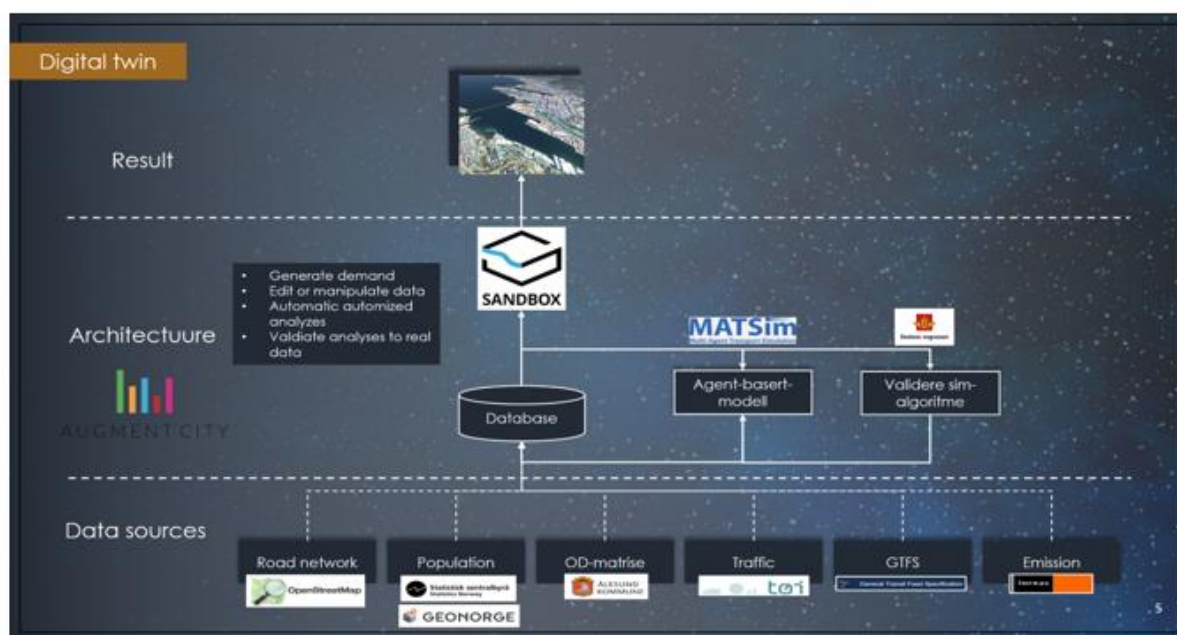


Figure 7 - Digital Twin: a digital representation of the physical city, Bodø (photo: Tor Kristensen)

Kristensen et al. point out that at the start of CityLoops there was no system for temporal storage of material or a marketplace to facilitate reuse of materials between projects. For example most of the excess soil from demolition an building project was landfilled instead of reused. With the start of the demonstration actions and associated pilots the municipality of Bodø started to play a role in facilitating physical locations for the temporary storage of building materials. Eventually, the stored materials are to be used in building projects. When they are demolishing parts of the military airport, and the new civil airport is to be build after that, then they could make these resources available for the new airport. These storage facilities are for permanent, also after CityLoops. Bodø Municipality will be the owner of the land, structures, soil, and other resources that are freed in the process” of moving the airport and constructing the new city district.

It is easy for the municipality of Bodø to get financial resources from external funding with proper arguments in terms of circularity: from the Norwegian research council, the EU and the National government. These enable to work with CE. And many employees in Bodø are financed by programs from the department of Environment in Norway. During the quick scan it was mentioned that the fact that Bodø Municipality owns the land resources where the demonstration action is to be practiced, helps the demonstration.

#### 4 Formal and informal rules, and regulations (including culture and adhesion to CE)

The city council has ambitions in terms of circularity, and it speaks from its participation in CityLoops project. During the quick scan in 2021 the representation from Bodø referred the common agreement in the municipality on the importance of a circular and sustainable treatment of CDW. In Bodø, there is political will to make Bodø circular. It is shown by the



engagement in projects like CityLoops. The participation in CityLoops is a political decision. The council supports the demonstrations in Bodø.

Culture within the offices of the municipality: The Bodø officer from the Development department finds that some people are more in the developing side, but many in other departments have a more business as usual approach. This can be related to the financial risks a department, e.g. the building of own property, runs. The property department may be afraid to apply used concrete because it is uncertain for them how long it lasts and if it is strong enough. Although it depends on the responsibility of a department, they should also be open to other impulses and inputs and how to work with building in property. Some departments are innovative and some are conservative. The officer suggests it relates to how close they are to the risk: building a school with materials that might not be strong enough is a risk they wouldn't like to take. But there might still be an improvement potential for those who are conservative. The internal culture within the office might be an obstacle to new ideas in terms of CE. There might be some aversion of actually trying to suggest new ways of doing things. It may depend on what you are working on, since it is in the nature of employees in the business and development department to come with ideas and provide these to politicians and the administration. People that for example work with accountants or salary would maybe encounter more obstacles to making changes. During the quick scan the respondent referred to the fact that officers are stimulated to cooperate with other departments, but that he or she may also run into problems doing so.

When the city is planning to demolish buildings, the use potential of the buildings should be evaluated. During procurement for construction projects for example, they demand that operators are using re-used materials as much as possible. They have a set of rules that they need to follow in order to reach their goals to become more circular. It is laid down in a politically manifested document and we need to follow it. The name of the policy document is "Overall environmental plan for Hernes". Hernes is the area of which the New Airport New City project is carried out. The document is divided into four categories: Energy, Nature Conservation, Circular Economy & Mass Handling. CityLoops set the Mass handling-strategy, but also participated significantly to the Circular economy category. This document is not only guiding, but also politically committing on how CDW and city development is done in the huge demonstration action/area (see Kristensen et al. 2023). During the quick scan the improvement of public procurement routines and the practice of stakeholder and inhabitant involvement using the CityLab was said to help the implementation of the demonstrations.

As concerns way of decision making: In Bodø an officer with an idea for a project presents it during an office meeting to the head of department e.g. concerning gathering data and making decisions based on this. If the head supports the idea, then the officer is sent to the municipal director and the management team of the municipality, and next, in case of approval, the idea will be presented by the officer in a political meeting that will vote whether or not try to implement it. Finally it will be presented to the city council. It is a step by step process through all levels. Facts and figures can help to improve decisions, since in the past a lot of decisions were made based on guestimates. CityLoops in Bodø is a counterweight to that, making it

possible for decisions makers to STOP doing unqualified decisions but rather use CityLoops tools to make INFORMED decisions.

In terms of communication between, for example the officer and the counselor, the respondent - from the business and development department - finds it uncomplicated to communicate things to politicians. When decisions are made there is a hierarchy, but in communication it is very flat. It is easy to communicate and share ideas. But the 'political secretary' department is the formal connection between administration and politicians.

The companies are eager to learn about circular procurement, because public procurement of services and goods is a big part of economic activity in Bodø and the companies still want to be a provider. Not only because of the environment, but also because of the money.

In the respondent's experience the citizens are more positive then he expected and happy to be invited. But it can't be generalized to every citizen because there might be opinions that the municipality doesn't know about. But if there is a meeting there is a good participation, the officers thinks.

Legal: Bodø municipality does not have direct authority over all the largest emission drivers in the Bodø community. Another legislative barrier in Bodø, is that they cannot store masses and materials if they are part of a demolition project. They cannot have an intermediate storage facility, because they need to treat the material as waste. This hinders the re-use of materials and masses, unless - the legislation says - you already have a project nearby that can use those masses and materials, then you can store them. It is still a challenge to find new ways of re-using the materials where they are! This law originally wanted to ensure that polluted masses and materials, and materials of bad shape, are treated or disposed in a safe way, and tested before re-use. The law says that when you demolish it, you have to bring it to the waste management facility.

According to the demonstration report "A national strategy for a green circular economy is manifested in 2021 [...], which may strengthen the national conditions for CE-business cases. Furthermore, regulations, taxes and guidelines are evolving in a direction that might lead to an increase of circular economic practice (TEK17 building regulations, EU taxonomy, mass treatment regulations). This increased practice of circular economy might be an opportunity to explore how circular business cases can be built."

### **3.3.2. Progress Bodø towards circular city**

Bodø self-assesses a level 4 for the progress in terms of becoming a circular city, with some reservations. According to the respondent, the main ambitions have a positive impact on becoming a circular city.

### 3.3.3. Economic context Bodø<sup>34</sup>

Bodø municipality had a bad financial result in 2021 and 2022 and is trying to reduce expenditures. There is a serious deficit. But the economy of the city itself is good. The respondent speaks of good labor numbers. Alike other countries in Europe Bodø is experiencing: increasing prices and interest rates. At the time that the demonstrations have started, 2020 it was easier to engage people in doing CityLoops activities without being financed by CityLoops. The municipal staff could use their own budgets and hours. While now it has to be financed by CityLoops. It now is the policy at the development department that everyone should be externally financed. The respondent is almost working as a consultant, being financed from different projects. Now both the local economy and the municipal budgets are under stress, it influences the possibility to put staff on circular activities. Also during the quick scan in 2021 the Bodø representation found that the economic challenges are in the way of Bodø becoming a circular city.

### 3.3.4. Physical context and spatial planning Bodø

The city of Bodø is positioned in the northern part of Norway. This physically remote position requires an extra effort from the city to keep young people in the city. The council finds it of key importance to keep the city attractive for its inhabitants, and especially the youth.

In the demonstration report they describe the situation of Bodø as follows: “The population density of Bodø is quite low with 40 inhabitants per km<sup>2</sup> of land area (2020). The population density of the rest of the region is much lower, and Bodø is the capital of Nordland County. There are long distances to nearby cities, and Bodø can in many ways be seen as a closed system, with a good overview of business activities and social phenomenon.” Building materials are not extracted in Bodø itself, because the rock material, clay and sedimental soil in the surroundings are not suitable as high quality building materials. Most construction material are imported, implying high emissions and costs. Nevertheless, construction materials and products like concrete, insulation material and glass, are produced within the municipality’s boundaries. The reuse of soil is made more challenging in Bodø. During the war large parts of the city burned leading to light to heavy soil contamination. Reuse therefore requires additional testing of the soil and additional consideration regarding whether and where to treat the contaminated soil.

Low availability of quality soil and long distance transport of imported soil increases the urgency to come up with a soil strategy. Presently, little soil is reused because soil reuse is not considered in public procurement and there is no logistics in place that facilitate companies in reusing soil.

In Bodø there are two large spatial developments taking place. The demolition of the military airport, the building of a new airport and the construction of a new city district on the site of the old military airport. The size and spatial proximity of the project is a chance for the

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<sup>34</sup> Section has not been checked by respondent



municipality to experiment with circular principles and realize environmental impact.  
(Kristensen et al. 2023)

BODØ								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>35</sup>	Concrete elaboration <sup>36</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>37</sup>			
	+ <sup>38</sup>	+	+	+ <sup>39</sup>	++			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	++ <sup>40</sup>	-+ <sup>41</sup>	-+ <sup>42</sup>	-+	+			
Resources	Capacity municipal officers towards CE <sup>43</sup>	Use of automated data generation CE	Other tools <sup>44</sup>	Financial resources	Storage facility <sup>45</sup>			
	+	+ <sup>46</sup>	++ <sup>47</sup>	+	++			
Formal and informal rules	Political willingness (council, exec. Board)	Willingness in city offices	Use public procurement to promote CE <sup>48</sup>	Local regulations <sup>49</sup>	Nat. legislation <sup>50</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>51</sup>
	<sup>52</sup> +	-+	+ <sup>53</sup>	+ <sup>54</sup>	+ <sup>55</sup>	hierarchical	-+	+
Economic context	Economy and budgets are under stress, low population growth, aging population							
Physical context	Remote Nordic location, small town approx. 50,000 inhabitants, 40 inh./km2, sea climate							
HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS? AND WHAT COULD BE DONE TO FURTHER PROGRESS								
<p>In general: No main policy discourse on CE which means that the policy base for CE is not optimal, because energy transition does not equal CE. But for huge new area the environment plan stipulates CE objectives and it guiding. Developing a CE policy that is well elaborated in roles as well can contribute to unleash capacity from other actors to progress in CE. Awareness raising about importance CE by more interaction with companies can maybe help create more CE dynamic.</p> <p>The economic situation implies extended dependency from external funding. Solutions in terms of piggyback riding CE with competing policies, like is already being practiced, can be a way to make do with funds from other policies.</p>								
Demo: Circular material management demolishing military airport				Use of national stipulation of rules for circular CDW via public procurement is favourable to progress in circular management of CDW beyond the case of the military airport.				
Demo: Stakeholder and citizens involvement in city development using innovative tools				Has been a useful step. Interaction with companies may enhance their awareness.				
Demo: Embed circular strategies into planning new city district				Useful demo. Should become common practice. Ways of decision making could be strengthened by targeted consultations of stakeholders, including citizens and by – as referred by the officers themselves – making good use of their input.				

Table 2- Context, circularity demonstration actions and suggestions for Bodø

<sup>35</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>36</sup> Of CE policy or carbon neutrality policy

<sup>37</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics (++) , putting CE to the background

<sup>38</sup> Linked to large new area

<sup>39</sup> Score is based on the fact that there is an active involvement and facilitation by Bodø of company and their activities

<sup>40</sup> Easy to consult other offices, and three cross-departmental groups on circular soil management, circular procurement and circular construction have been established that will last after CityLoops comes to an end

<sup>41</sup> Not current but can consult politicians

<sup>42</sup> 'to listen to citizens better', for citizens well accessible website

<sup>43</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>44</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>45</sup> There are structural storage facilities indeed assured for CDW and BW projects in Bodø

<sup>46</sup> Use ongoing.

<sup>47</sup> GIS and drone mapping of volumes

<sup>48</sup> Referring structural use only, so not if only in the demonstrations

<sup>49</sup> Does the city or region make use of local regulations to support CE?

<sup>50</sup> Is there specific national legislation that supports or facilitates local CE policies or actions? E.g. end of waste crit.; strategy green CE, public role waste

<sup>51</sup> Different from willingness which means going into action as well!

<sup>52</sup> Politicians are quite eager (cross consortium meeting 22 Sept 23 Kristenssen) Circular economy category in the environment plan for Hernes (new airport district). This document is not only guiding, but also politically committing on how CDW and city development is done in the huge demonstration action/area.

<sup>53</sup> 'routines'

<sup>54</sup> Operators to reuse material as much as possible

<sup>55</sup> End of waste criteria, strategy green CE, storage nearby for reuse

## 3.4. Høje-Taastrup



Figure 8 - Høje -Taastrup station, close to the Danish capital Copenhagen (photo Høje-Taastrup municipality)

### 3.4.1. Political and policy context Høje -Taastrup

#### 1. Policy content in Høje-Taastrup

In Høje-Taastrup climate is one of the most important policy issue of politicians in general. This enables officers to build on it by making specific elaborations in terms of policy objectives for CE and using the policy as argumentation for their actions. CE is included as subject in the policy for climate change mitigation, according to the respondents. The municipality is working on a sustainability strategy, and it has not yet been adopted. The process was initiated by the climate committee under the city council (consisting of political representative, company representative and non-profit organisation representatives). The sustainability strategy was an action in the latest climate plan (I know that it logically would have been the other way around, however, in HTK it started with the climate plan). It will include an action plan – on a general level, for instance an action/target saying that every department will have a process of identifying how they can improve sustainability-wise and eventually implement changes. So far, we did not discuss the time frame for implementing actions. It is important to place the responsibility in the departments – to secure ownership. The municipality mentions the roles of the municipality (several roles – authority, land owner, facilitator etc.), companies, citizens etc. CE is one of several issues in the strategy. In the future, stakeholder mapping can be used prior to projects instead of retrospectively.

Traditionally, already for many years social housing areas and social issues in general are also a very important policy ambition for the politicians.

Five demonstration actions were organized in Høje-Taastrup around the development and construction of the new City Hall and the demolition of Taastrupgård: 1) transformation of the old city hall grounds, 2) demolition of Taastrupgård, 3) construction of the new city hall, 4) recycled sidewalk tiles and 5) circular soil management. Several of these demonstrations were strongly interlaced, with Taastrupgård providing the source concrete for the recycled foundation of the new city hall, and circular soil management taking place between these two projects as well (Hessen and Yates, 2023).

The respondents don't think there are any policies working against the demonstration actions. The incorporation on CE-principles into the citywide strategy, and thereby commitment of the council, is now in development with the sustainability strategy in the making (info L.H. Sept. 2023).

The demonstration report of Høje-Taastrup on CDW states that the municipality focuses on making the municipal demolition and construction projects more circular. Also it tries to influence the work on sites the municipality does not own. The demonstrations project on the reuse of tiles was not as successful as planned. In the end they did not use tiles made from CDW in the plan for the new city hall because the small quantities of different colours could not be produced economically feasible. Another area to test recycled sidewalk tiles now will have to be found. This proves difficult in practice, but the municipality will continue to advocate their use for future developments and remind their own roads department.



*Figure 9 - Taastrupgård, Høje-Taastrup (Photo: Høje-Taastrup Municipality)*

## 2. Cooperations/involved parties

The involvement of the mayor in a joint committee with companies and his service oriented mindset is helping the constructive exchange on legislation and other ways of facilitating the companies' transition towards circular practices and energy transition, the respondents find. The mayor is actively reaching out to companies about the CE. He is among others in touch with Rockwool, DSV transport company and Microsoft about CE. For example Rockwool and DSV land transport are actively participating in exchanges on practices, engage in sanitation of polluted soil and climate adaptation (Rockwool) and the purchase of electric vehicles (DSV). With Microsoft the mayor discusses how the company could use sun energy and heat of cooling for district heating.

Internal office contact to partners in the other departments, e.g. about the idea to have a sustainability group, is easy for officers, and fast. There is no problem to make a call. With the sustainability group they try to break down the barriers between these different departments and that works very well. The internal cooperation profits from the Sustainability Group. The group raises awareness of circular economy across the organization. The group works as an inspiration forum where members share relevant experiences with each other - and brings the inspiration back to their own departments. The group consists of employees from across the organization - who are all passionate about sustainability and interested in moving the municipality in a more sustainable direction.

In some other cases they have to go via the department. A big part (not all!) of the sections of the city administration are participating to contribute to Høje-Taastrup becoming a circular city.

The demonstration actions have not worked directly with citizens. The demonstrations are mostly within the administration. But most of the people know about the circular concrete in the City Hall, because the city has been communicating quite a lot about it. The public finds it positive that there is recycled concrete in it, although many people think it is a very bad idea to have a new City Hall. But the mayor gets more than one third of the votes when there are elections, so the officer thinks most people find it a very good idea what they are doing. They are also working on the sustainability strategy in Høje-Taastrup since recently. In this strategy they have to think about how to work with citizens and companies more sustainably. This is rather new, they are now planning working on it. The city office is not yet there in terms of engaging citizens.

There are different ways in how the companies come into the picture in relation to becoming a CE. That depends a lot of the project. Sometimes the companies come to the municipality for advice on how to recycle, and the municipality provides help by the municipal environment officer. The other way around is also occurring, that the municipality presents an idea and checks whether the company is interested. This goes mostly for the construction sector. And it also depends a lot of what role the municipality is in. When they are e.g. building the new city hall, as contractors, they can express their demand to the entrepreneurs. When it is a private developer they would try to nudge them, like when it is about developing a department block. There are different ways of approaching them. Other times the municipality is interested in what a company is doing. It is also very much person dependent, i.e. whom you are working with in the private company. The demonstration report underlines the importance of stakeholders' willingness to experiment with CE.

In the demonstration report the authors underline the importance of "the right people being involved at the right time" "Høje-Taastrup Municipality initiated a close dialogue with IKANO about sustainable and circular initiatives in the pre-purchase phase concerning the old city hall. The company showed a great interest in circular and sustainable initiatives."

The demonstration report underlines the importance of stakeholders' willingness to experiment with CE. On the other hand, companies are concerned about potential risks and who is taking the responsibility for the quality and performance of the reused/recycled materials. For example, under Danish law it is not allowed for a municipality to take certain types of risks for a private company, because that would give this company an advantage



over others. The municipality is therefore dependent on the companies' cooperation. This became evident in the demonstration action on recycling of pavement tiles where the company behind the urban development in Høje-Taastrup was initially interested in reusing pavement tiles. Eventually the company refused to integrate them in the new sidewalks because they lacked a guarantee of quality and durability. The risk in this case consists of the company having to replace tiles prematurely in case they break.

In the demonstration action on building the new city hall they used concrete with 100 % recycled aggregate. However, the contractor's advisor asked for several extra tests on the quality of the material. To speed up the process, an involved concrete specialist from a private company (Pelcon) with whom the municipality works more often, took the responsibility for the quality of the concrete in a written statement. The fact that Norrecco (company specialized in recycled CDW) opted to get the recycled aggregate certified as part of their investment in product development in offering recycled aggregate as a product, also subdued the risk aversiveness of the contractor. Also, barriers to reusing soil have been uncovered by interviewing stakeholders.

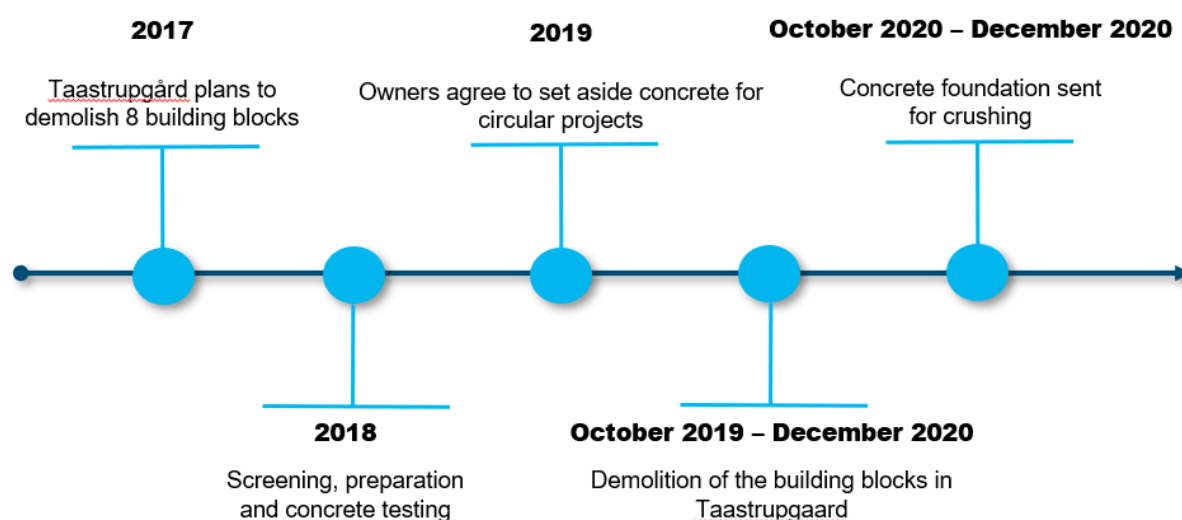
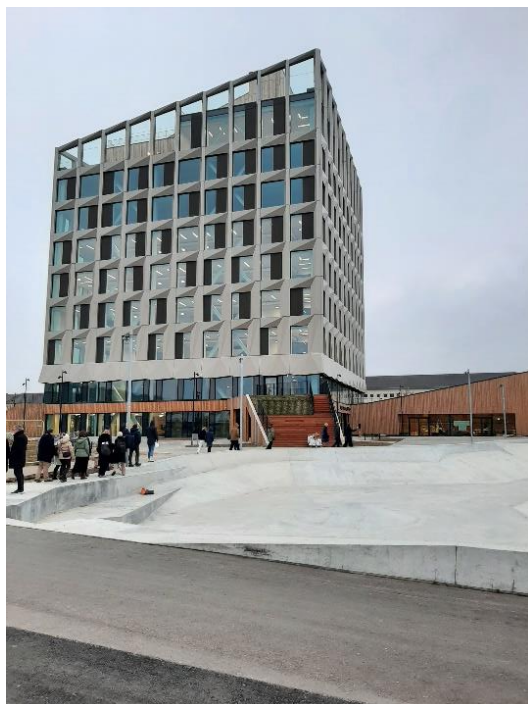


Figure 10 - Timeline demolition Taastrupgård, Høje-Taastrup (photo: Høje-Taastrup Municipality)

A role the municipality played in the demonstration action on the demolition of the social housing area Taastrupgård was to organise a location where the concrete to be re-used could be stored at no cost for the contractor nor the social housing company that commissioned the project. Unicon is the company that mixed the concrete from Taastrupgaard: Unicon was very satisfied with the cooperation and dialogue but considered the small quantity of the recycled material as a challenge due to the space it occupies in their silos. In the future, Unicon would prefer to receive larger quantities of recycled materials. Recycled aggregate has to be managed separately, which makes it more difficult to manage in small quantities compared to the required effort.



### 3. Resources



*Figure 11- New City Hall and skating area*

For the CE specifically Høje-Taastrup does not use very much budget. You can not separate CE versus the rest of the economy. respondents say. In terms of Human Resources much initiative comes forth from the officers, we learn from the respondents. During the quick scan in 2021 the representation from Høje-Taastrup also wrote that they do cooperate with other departments. The help from a consultant, expert with great experience with circular requirements in tendering was called upon by the office to develop the approach for circular handling of the city hall in cooperation with the IKANO company. Sometimes cooperation of the officers with other departments is hindered because the other department lacks knowledge on CE. The municipality is developing tools to support the process towards circularity. E.g. a sustainability

strategy is under development, a soil management tool has been adopted, a roadmap to municipal roles, a sustainability group has been established.

### 4. Formal and informal rules, and regulations

Political willingness The city administration is very motivated to contribute to Høje-Taastrup becoming a circular city. The officers have a very wide space within the administration to work with CE. If officers come up with ideas, supported with facts and figures they have the confidence of the politicians. (practice of entrusting the interpretation of the ambitions and the practical work to officers). The ambitions of the city's politicians to become circular are rather a framework in which the CE fits in very well. But the politicians are not very specific about it, the respondents say. During the quick scan the officers also referred the political willingness to move towards circularity and the openness to bottom-up initiatives like the demonstration actions by the officers.

In Høje-Taastrup the interviewed officers feel there is a political will at the level of the mayor, that the city has to take care of the environment. The frontrunner attitude of the mayor is helping the process of becoming a circular city, in the eyes of other municipalities. It are not the politicians in general. The City Council is more following in this respect. They support the circular actions that the offices develop. "... when we do projects that are working very well, they are very proud." Among the general public there is a good awareness of the environment and the issue of becoming a CE.

The respondents have problems to deal with in some other departments that have a different focus. There the officers put a continuous effort to influence them. Certain sectors, e.g. teaching, might not be that interested in CE. It has to do with what they feel is their real focus.

As first action to make the incorporation of CE-principles less dependent on the staff involved, Høje-Taastrup contributed to the development of a roadmap to municipal roles and improvement of circular soil management, and CE criteria are now included in policies.

Decision making ways are generally not top down, nor political, although this may happen occasionally. And facts and figures and knowledge are certainly a basis for decision making. Decision making is taking place in consultation with residents and companies. Efficiency can be a point of attention of the government. For example, the tendering of the uniforms by the Procurement Department: Uniforms for health care workers and kitchen staff should be recycled, and not burned. They demanded they are reused and recycled when worn out. This was put it in the market, and it was possible to do so. This inspired other departments and probably also other municipalities to more circular procurement.

Quite a bit is decided by administrative officers, more than in other municipalities. 'It makes a very nice work environment, when you have the confidence'. And it makes it easier for officers to go to colleagues in another department and ask for instance whether the other department can use recycled aggregate, like for the new town hall. We don't have very big decision making processes, that makes it quicker. It depends of course of the issue, this does not go for the larger urban development areas. There they need to decide various times. But in relation to the demonstration actions, it makes it very easy. It makes the officers more ambitious, more courageous. Obstacles in terms of decision making sometimes are put by the management if they think something is not a good idea and for what reason.

In general the respondents provide a very positive picture of the decision making. Eg. The example of the organization of the Sustainability Group that was suggested by the environment officers to their manager. Step by step the idea was forwarded to the next management level, as a formality. It went from manager to director to the board of directors, and at times, like for the agreement to engage in the CityLoops project after the project had been awarded, to the City Council. Mostly the officers start a project without political interference because the management has a very good idea about what the politicians would like. Otherwise they would not go for it. There is a lot of confidence between the council and the administration, and the other way around. Because the council has the experience that it works. It has been the culture since a lot of years. It is a very smooth way to work together. The trustful relation comes with a low mobility of staff at the management level. They have developed this culture of trust and cooperation in the last 16-17 years. It started with the coming of the present mayor, the respondents say.

From the CDW demonstration report we learn however that "The CityLoops project gave interesting insight into how planning and decision-making has taken place in the municipality, and how it should take place in the future. Looking at our various demonstration actions, it became clear that there was no structure in place to ensure circularity or sustainability, and the success was due to identifying and taking advantage of windows of opportunity as well as cooperation with passionate and willing colleagues. The high level of chance involved in this model does not make it a very robust system for ensuring circularity. In the municipal

organization there wasn't any obligation to ensure circularity either, among the various roles our colleagues play in building and development projects: there is no political mandate or internal policies which prioritize that circularity or sustainability should be taken into account. There is also no procedure that ensures that the relevant departments consult one another to ensure a common vision for sustainability. It became clear that specific structures need to be in place to ensure that sustainability and circularity are taken into consideration." In the demonstration report the authors write about the need for a structural approach to include CE-criteria, for example in a citywide sustainability strategy. Høje-Taastrup participated in developing the planning and decision making methodology. In the co-development process, a framework was used to map key actions in the different phases of the demonstration actions. This exercise facilitated a reflection process on learning from the projects, hence fostering a formalizing of circular procedures for future projects.

According to the representation of Høje-Taastrup during the quick scan in 2021, it are cultural issues (within the offices? Within wider society? At the level of companies? Some or all of these?) that hinder further progress towards a circular city in Høje-Taastrup. Engagement among the public is considered very high and large companies are getting involved in joint projects with the municipality.

Willingness of companies to contribute to CE In Høje-Taastrup some companies are very upfront and very interested and really like to promote themselves. Some are not interested in CE. Others are very interested but don't get the change to develop their ideas because the tendering is like it used to be. But there is more and more focus from all of the companies.

The municipality developed the ToR Soil tools for sustainable soil management and did some interviews. One company wanting to dig up the soil for piping was very interested to become circular and manage soil more sustainably. They found that the traditional tenders because of their short notice leave no time to develop more sustainable soil management suggestions to include in the offer. Also the description in the tendering format gave no room for ideas to use the soil in a different way. So companies had to do like they have always done it. Those were a barrier for the soil management. It varies a lot from company to company, and from tendering to tendering.

Here and there, there are some legislations and rules that make it more complicated and the respondents say they usually find their way through, sometimes with the help of the CityLoops partners, Gate21 and other more experienced partners. E.g. in the case of the foundation of the new city hall there are the requirements about the quality of the recycled concrete. With new concrete you do not need any extra tests because it is certified. But with recycled concrete you have to test. That concrete of the new City Hall is probably the most tested concrete foundation within the municipality. It is an issue about taking the responsibility for the quality of the concrete. But they found their way through.

From the demonstration report we also learn about the Pre-purchase development agreement." Danish procurement law allows companies to participate in the planning of the development of urban areas under special circumstances. Hoping to secure such an agreement, in 2017 the municipality outlined the parameters of an agreement for developers to consider. IKANO approached the municipality hoping to make a pre-purchase development agreement with the urban development department based on this outline. An agreement was

signed in 2020, and this allowed IKANO to influence how the property would be developed after the sale of the grounds. The city hall had to be sold on the open market, however the pre-purchase development agreement ensured that IKANO had the advantage of the opportunity to re-bid with a new price if another developer outbided IKANO. Circular requirements were formulated over the course of extensive dialogue with IKANO and the urban development department. These criteria were limited by a combination of what legally can be required in public tendering (according to the Danish municipal power of attorney and fair competition), by political mandate to prioritize earnings from the sale over sustainability, as well as by the pre-purchase development agreement, which had to be complied with. “

### 3.4.2. Progress Høje-Taastrup towards circular city

Six to seven years ago Høje-Taastrup started with the CE Interreg project CleanTech Tipp (2016-2019). Before that the officers already organized local actions on CE. So they have quite some experience with CE issues. The officers self assess the progress at 4-5. “We have made some progress, but we still have a long way”.

### 3.4.3. Economic context Høje-Taastrup

Høje-Taastrup is fast growing in number of population and has a very strong economy. This requires the provision of facilities. In general terms the politicians rather spend money on schools, kindergarten and other social issues, then on climate issues. Otherwise they would not be elected in the next elections. It are quite a lot of expenses. Many countryside residents who want to be near Copenhagen and can not afford to live there, move into Høje-Taastrup, as well as many families coming from Copenhagen. They get better houses for what they can afford, and closer to nature also. You can not separate CE versus the rest of the economy. CE goes into all these uses, developments or aspects of the municipality. The whole staff would be nudged towards thinking in these manners. The goal of the environment department is that the CE is part of all the administration’s way of thinking. It is the way of doing things, part of the culture, and the way of thinking. There is no influence of the financial situation of Høje-Taastrup on the CityLoops demos.

### 3.4.4. Physical context and spatial planning Høje-Taastrup

For Høje-Taastrup and its CDW demonstrations the physical characteristics of the city was said to not influence the implementation of the demonstrations. During the study visit autumn 2022 it was however added that the skating area in front of the CityHall should keep rainwater in order to prevent percolation through polluted subsoil. In 2021 during the quick scan the Høje-Taastrup representation wrote that the the fact that the city has many ongoing

building projects, so a lot of opportunity for flow of materials, helps the demonstrations. During the study visit late 2022 it became clear that the physical characteristics of the city do influence the demonstrations in Høje-Taastrup. E.g. for crushing of concrete to be reused, a site more remote of the residential areas was purposely chosen to reduce the noise nuisance for residents. So physical facts to influence the demonstrations and their CO2 impact. And soil had to be intermediately stored until the site in Taastrupgård was ready form receiving it. In addition, availability of spaces within the urban fabric where materials can be stored is important. This was available within the urban development area of Høje-Taastrup C. However, parking underground was chosen in Høje-Taastrup because of lack of other space for parking. This brings a lot of soil excavation and transport with it. The speaker from IKANO confirmed that less compact cities also allow for more space. In open land areas (new terrain) more is possible [in terms of circular uses and CO2 emission reduction in the demos] than within existing urban fabric.

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HØJE-TAASTRUP								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>56</sup>	Concrete elaboration <sup>57</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>58</sup>			
	-	+	+	++	--			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	+ <sup>59</sup>	+ <sup>60</sup>	-	++ <sup>61</sup>	-+ <sup>62</sup>			
Resources	Capacity municipal officers towards CE <sup>63</sup>	Use of automated data generation CE	Other tools <sup>64</sup>	Financial resources	Storage facility <sup>65</sup>			
	+	-	+	++	-			
Formal and informal rules	Political willingness (council, exec. Board)	Willingness in city offices	Use public procurement to promote CE <sup>66</sup>	Local regulations <sup>67</sup>	Nat. legislation <sup>68</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>69</sup>
	+	+ <sup>70</sup>	+ <sup>71</sup>	++ <sup>72</sup>	+	all 4 types <sup>73</sup>	+	+
Economic context	Strong economy, lots of building processes going on							
Physical context	Not very dense city, near city of Copenhagen with good railway connection							
HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS? AND WHAT COULD BE DONE TO FURTHER PROGRESS								
<b>In general:</b> Favourable conditions for success have been created before and during the CityLoops project. Window of opportunity has been used to implement circular actions around the demos. A sustainability strategy is under development that includes a section on CE, as results of the awareness raised by the demonstrations (contr. Hessen nov. 23). The strategy aims at making all departments responsible for sustainability, including CE. Development and discursive use of a CE strategy can strengthen awareness among companies and citizens and further increase societal engagement in CE. Capacity among citizens could maybe be used to greater extend.								
Implementing circularity selling town hall	The windows of opportunity were used: own property development and management are used as opportunity to experiment and develop circular CDW actions. Open consultations with companies possibly has supported the approach with IKANO. Pre-bidding legislation supported the cooperation limiting the risk for the company to loose its investment of time and expertise. How can the city create an impact beyond the own property management, i.e. stimulate companies to engage in circular CDW for housing or business sites?							
New city hall	Profited from fact that other demolition project was ongoing. See under ‘general’. And it was to a high degree dependent on an officer’s, persistency – she saw the window of opportunity and the timing between the demolition of parts of Taastrupgaard and the construction of the new city hall. She insisted on bringing the opportunity for reuse of material up whenever possible to whoever with influence – in order to raise awareness of the (on that time) slowly growing focus on circularity. At that time the city’s policies and strategies were not very focused on CE and therefore it was not an opportunity to point towards a strategy or a political obligation. It was more the other way around – the success of the demo projects has resulted in more focus on CE – also on a political and strategic level.							
Taastrupgard	The fact that the city is not very compact enables the storage of soil or CDW within the urban fabric and nearby the work site.							
Recycled sidewalk tile	Attention to informing citizens about fact that the tiles are recycled! But the restricted number of tiles was the problem for this demonstration!							
Circular soil management	See general.							

Table 3- Context, circularity demonstration actions and suggestions for Hoje-Taastrup

<sup>56</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>57</sup> Of CE policy or carbon neutrality policy

<sup>58</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics (++), putting CE to the background

<sup>59</sup> Sustainability Group

<sup>60</sup> Confidence between offices and politicians

<sup>61</sup> Via active mayor and via circular building projects, and Norrecco company mentioned

<sup>62</sup> Concrete-specialist Pelcon mentioned

<sup>63</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>64</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>65</sup> No structural storage facilities assured for soil or CDW. Found intermediate storage area for very short period of time in a development area for soil storage and for concrete crushing an external site was used (contr. Hessen).

<sup>66</sup> Referring structural use only, so not if only in the demonstrations.

<sup>67</sup> Does the city or region make use of local regulations to support CE?

<sup>68</sup> Is there specific national legislation that supports or facilitates local CE policies or actions? E.g. end of waste crit.; strategy green CE, public role waste

<sup>69</sup> Different from willingness which means going into action as well!

<sup>70</sup> Big part of the offices, since recently also a roadmap to municipal roles



## 3.5. Mikkeli<sup>74</sup>



Figure 12 - Mikkeli (photo: Mikkeli municipality)

### 3.5.1. Political and policy context Mikkeli

#### 1 Policy content

For Mikkeli an employee of the development company Miksei has been interviewed. Miksei's experience with the decision making process in the city of Mikkeli is from the outside the municipality.

Recently, the city council has approved a City Strategy for the years 2022-2025. One of the key priorities in this policy is CE. Public company Mikkeli Development Miksei Ltd. is responsible for promoting companies to launch their own eco-efficiency and sustainability projects. Goals are the better collection and sorting of BW with clear percentage wise targets for 2025 and 2030, use of locally produced transport biomethane, and that the city offices will acquire only cars that run on biogas or electricity. The City Strategy also aims more efficient biomass processing and nutrient recycling as well as development of valorised products from biomass. It states that by 2025 25 % of tenders related to CDW and BW should include climate related requirements and criteria related to sustainable development and CE. The municipality is also committed to include CE in all vocational education curricula (Malk et al., 2023). There is also the climate ambition CO2 neutrality in 2035 supporting Green Economy

<sup>71</sup> CDW and e.g. care workers uniforms, ..)

<sup>72</sup> Criteria in policies, parameters pre-purchase development agreement

<sup>73</sup> not very big decision-making processes

<sup>74</sup> Only table has been checked by respondent

developments. The climate program stems from December 2021. It will help future demonstrations, and in general. CE is included as important element in the Climate Program for Mikkeli City, with a separate section on “Recycling of materials in construction”.

The respondents also refer the support by the Circular City Declaration. We however did not find this declaration on the city website, but only the international external Circular City Declaration website, which suggests it does not play an important role in local politics or local awareness raising.

Two demonstration actions were conducted on BW. Demonstration 1 was focusing on activating residents to sort BW more efficiently to increase nutrient recovery and the business opportunities. Demonstration 2 was targeting on optimizing the biogas process and utilizing final products with laboratory scale experiments, techno-economic evaluation, and procurement guidelines.

For CDW also two demonstrations were executed. Demonstration 1 were case studies of the demolition of two public buildings: a Health Care Centre and a hospital. Demonstration 2 was action research of the decision-making processes and policy interventions related to systemic changes needed in the setting of CE policies, planning, market engagement, procurement, contracting, permitting and enforcement of public owned demolition projects and waste management and reuse of building parts and wastes (Haapea et al. 2023).

## 2 Cooperations/parties involved (first on BW, then on CDW)

The BioWaste demonstrations were conducted with stakeholder groups: waste management company Metsäsairila Ltd, biogas company BioSairila Ltd, municipal housing company Mikalo Ltd, residents in Peitsari demonstration area and local environmental authorities.

Cooperation with citizens goes well in the BW demonstrations. Malk et al. (2023) find that the distribution of free BW bags to residents during all events was the most effective communication measure. It proved to be a practical and effective way of conveying the message. The promotion of BW sorting was extended to several other events throughout the Mikkeli area, targeting people of different ages. Face-to-face discussions proved to be effective in promoting BW sorting. And the use of imagination, creativity and visuality were found to be important in engaging with people. For an event that targeted children, the project team dressed up as fairy tale characters and organized exciting games to engage with them and share the message about sorting BW in an inspiring way (Malk et al. 2023). Xamk engaged in talks on benefits and challenges of BW sorting with the local communities. BW sorting was promoted to the residents of Mikkeli in ten events in the course of 2020-2023. Also the organisations directly involved in the operation of BW collection and sorting in the Mikkeli region were involved: Metsäsairila Ltd and Mikalo Ltd which is the municipal housing company. A workshop on BW collection and sorting through service design was held in 2021, where both stakeholder groups were involved. Malk et al. (2023, p39) find that conventional information campaigning is not very effective, and that more creative and unconventional information campaigning should be implemented.

For the biogas demonstration New treatment a final product stakeholder group consisting of Metsäsairila Ltd (municipal waste company), Biosairila (biogas plant) and Etelä-Savon

Energia (a biogas distributor) was established in January 2021. This stakeholder group has an operative role in managing and treating the BW in the Mikkeli region. They helped and gave practical guidance to coordinate and facilitate the demonstration actions, and met eight times to examine the progress and discuss optimisation adjustments and upscaling. (Malk et al. 2023).

As concerns the CDW: Mikkeli has handed over responsibilities for waste management to companies and finds employment promotion and stimulation of business important. In terms of coalition this is rather a commissioner-contractor relation. The city's Building Services organized a market dialogue on 27 August 2020 together with Miksei Ltd. Several demolition companies participated, physically or online in the market dialogue. The content of the tender documents and the demolition process was created directly through the interaction between the CityLoops project, the city, and the waste company. Some thirty stakeholder meetings were arranged, five workshops for the decision makers, procurement personnel and other professionals of the CDW sector in Mikkeli. Main stakeholders were Mikkeli city building services and procurement services, City Board and leading civil servants in strategic issues, demolition contractors, a consultant, the city owned waste company Metsäsairila Ltd., private companies participating in market engagement and business, local and regional environment authority in permitting and supervision, a vocational school in reuse experiments, and the Mikkeli Activity Centre in reuse activities. Better coordination is needed between environmental authorities and building permit authorities and the units implementing public procurement, Hapea et al. (2023) write.

Citizens involvement can't make a big difference concerning CDW CE, according to the respondent. If citizens are building and left with some bricks, cement or building material they want to get rid of that and want to sell it to someone who needs it, via social media, and not for free. They are not putting it to the garbage.

The respondent refers to the events they organized in the context of CityLoops. They had a children festival and a national farmers exhibition in Mikkeli, where Miksei was showing the CityLoops project in a stand. Miksei and Xamk organized this stand together with Metsäsairila. In September 2022 they had a pop up in the local shopping center, together with a repair workshop: repair your clothes. They gave a presentations of BW management and collection. The citizens' feedback was communicated to the city. The Miksei respondent feels that communication of citizens' feedback to the city administration should be done more often. Metsäsairila and Xamk - will have another day, with the citizens.

Haapea et al. (2023) find that the roles between Metsäsairila, the Activity Centre and private companies need to be clarified in implementing the City Strategy.





*Figure 13 - Separate demolition of brick façade Mikkeli (photo Raimo Lilja)*

### 3 Resources

Mikkeli has promoted and invested especially on the research, development and infrastructure of water technology, material cycles and renewable energy, including the new biogas plant BioSairila (Malk et al. 2023, p11) and EcoSairila. The city has been building EcoSairila development platform to enable closing material loops and supporting new sustainable businesses to develop. EcoSairila is a hub for regional material cycles and is profiled especially in water treatment technologies. It brings together a wide range of companies, public actors, RDI and education organisations to form a unique innovation ecosystem. Close cooperation with local actors and authorities, as well as strong networks of experts, guarantee fruitful cooperation (Etusivu - EcoSairila, own translation).

As comes to the human resources Malk et al. (2023) observe that when preparing procurements, it is important to first cooperate with experts, so that the substance and goals relevant to the procurement are first well understood. In terms of financial resources, in Finland, the production and use of biogas is supported with various energy- and investment subsidies (Mutikainen et al. 2016, in Malk et al. 2023).

To support the CDW actions multiple tools were adopted: monitoring and 3D modelling of buildings and materials, a digital material market, a databank, pre-demolition audits, a guide for selective demolition and life cycle CO<sub>2</sub> calculators for Demolition and Renovation Sites, for concrete and for soil transport. Mikkeli used the Roskilde University framework and methodology for promoting systemic changes in the municipal decision-making process

related to CDW in view of CE. It addresses e.g. types of decisions to make and stakeholders and knowledge to involve, strategy, operations and capacity building.

The CityLoops project and other circular economy projects were also helpful to the demonstrations, the Miksei and Xamk staff wrote during the quick scan. From the demonstration report we learn that the laboratory-scale experiments provided Mikkeli with new knowledge that can be used at the biogas plant. Some insights need further development before they can be commercialized. At the level of households - inadequate access to apartment-specific bio-waste bins and waste bags, hindered adequate separate bio-waste collection.

#### 4. Formal and informal rules and regulations

Political willingness: The town of Mikkeli is located in Southern Savo, a region which already in the 1990-es had the ambition to be the most green and sustainable region of Finland. More recently short term thinking and short term planning take place and the city has moved more towards making business as usual. This development goes with the current focus on employment, attractiveness to youth, turnover and attracting companies. With this, attention to CE lessened and sustainability does not get as much attention as before. Also during the quick scan in 2021 the external experts found that it are rather the politics that are in the way of Mikkeli becoming a circular city. Nevertheless the respondent mentions that there have also been initiatives from the council focused on circularity (see policy content above).

In Mikkeli the respondents state that concerning the culture within the offices, some heads of departments are somewhat innovative but in general the approaches are rather conservative: officers work as they are used to and following strict processes that do not lead to innovation. The politicians need to set out new practices if a change of internal culture is to be made. The city's procurement department contributes to the circulation of biomaterial flows by being responsible for tenders, e.g., restaurant services, biogas-powered waste trucks and buses as well as soil products used in green areas. Procurement policy should be reasonably uniform across the entire Mikkeli Consortium, which means the City administration and all the city owned companies. Instead of each working in their own "silo" the units should participate in implementing the common goals regarding sustainability and climate issues, Haapea et al. (2023) find.

As concerns the ways of decision making: Initiatives are coming from the members of the city council or the citizens. Initiatives are handled according to the Finnish law or the system. It can go through many stages, can take few months, sometimes much quicker, sometimes one year. It depends of whether for example a feasibility study are needed or not. For land use decision making goes pretty much top down, but it always includes some interaction. If discussed properly, even then, after two years the city council can take another decision on the same matter. Decision making is a combination of the four characters: top down, knowledge based, in consultation, not spending too much time and money on decision making. The council discusses, then it goes to the board. Data are used to inform decision making in Mikkeli.

Sometimes administrative officers are presenting big ideas. The board decides on big things. In the administrative offices there is not much place for discussion on for instance what to do with demolition waste.

The council doesn't know about the CityLoops demonstrations. CityLoops tried to raise some awareness, but the project was written with Miksei and Xamk, not with the city of Mikkeli. A change to influence policies is thereby foregone.

Citizens have a positive attitude towards the CE. In Finland a 20% minority is not convinced of circular or green values. Research in Finland says that in general second hand clothes or equipment use is slightly above 50%. It may be the same in Mikkeli.

Deloitte (2015) write that “ wide implementation of more advanced practices (e.g. in selective demolition) is challenging due to large-scale differences of operators as well as sites; the revealed misconducts and offences have violated the reputation of the activity in the market; Partly immature market for CDW recycling leads to lacking adaptation of relevant standards and best practices; Higher price of prefabricated or tailor-made solutions which usually reduce material wastage; Wastages due to over-dimensioning of material needs, insufficient packaging/protection of materials at construction sites and damages during transportation; Low demand and price for used construction parts.”

Concerning legislation. The waste management authority is the City Development Board. The control authorities of waste management are the Mikkeli Region Environmental Board and the regional South Savo Centre for Economic Development, Transport and the Environment. Metsasairila Ltd, a waste management company owned by the City of Mikkeli, handles statutory service tasks for waste management, such as the maintenance of a waste treatment plant, recycling of exploitable waste, management of hazardous waste, maintenance and development of the waste point network in the sparsely populated areas. The company also provides development, advice and information for waste management.

The city of Mikkeli has its own waste management regulations which are approved by the City Development Board. Municipal waste management regulations are local regulations issued under the Waste Act. Regulations supplement the waste legislation and are followed in the Mikkeli city area. Separate BW collection is obligatory by local rule.

Malk et al. (2023) note that the world is changing very rapidly when it comes to fuels, energy, and their use. It is hard to keep up with all the new directives, laws, subsidies, and the latest technology related to transportation. Finish parliament has approved the promotion of the use of biofuels in traffic by amending the Distribution Obligation Act, providing the extension of the scope of the national distribution obligation for transport fuels, to biogas and renewable liquid and gaseous fuels of non-biological origin. Also the Renewable Energy Directive (EU) is expected to positively impact the profitability of biogas on the long term (Malk et al. 2023, p49). It remains un-concluded what the impact of the Fit for 55 package from the EU would mean for the use of biomethane as a sustainable fuel for cars and trucks.

Deloitte (2015) refers 7 relevant formal documents at the national level: Waste Act 646/2011; Government Decree on Waste 179/2012; Land use and building Act 132/1999; Land use and building Decree 895/1999; Environmental protection Act 527/2014; Environmental protection Decree 713/2014; Government Decree concerning the recovery of certain wastes in earth construction 591/2006.



The Finnish Land Use and Construction Act and the Waste Act requires owners of the demolition project to apply for a demolition permit and submit an estimate of the types of waste generated and a plan for their waste management. The project should be planned and implemented in such a way that usable objects and substances are recovered and reused, organizing separate collection for eleven types of waste listed in the Decree and recovered to the highest possible quality in accordance with the waste hierarchy. A nationwide target of 70% has been set for the recycling of construction and demolition waste (Haapea et al. 2023).

In the tender by Mikkeli quality criteria that would have promoted the circular economy and related innovations were not included. There were no minimum requirements for soft stripping and indoor demolition or quality scores for source separation of waste. There was fear that it could increase the total costs or that the verification of quality criteria could be challenging (Haapea et al. 2023).

The handing over of waste management and management of buildings to a company has reduced the CE possibilities since the company has less possibilities in terms of sustainable management as Mikkeli herself would have had as public authority and owner of the buildings. So the present legislation that waste needs to go to Metsasairila company certainly hinders CE: it doesn't allow companies to go to the market with the CDW. It means that the company that demolishes the buildings is legally not able to keep the materials to itself. Legislation could help if they be allowed to decide what to do with the materials: instead of only transporting it to the public waste company Metsasairila, the company could sell it, or crush or grade it. "The in-house waste fee is only 30 % of the corresponding market price. This practice was designed to prevent dumping of waste in illegal places, but on the other hand it has prevented contractors from offering innovative recycling options or from using its contact network to find reuse or upcycling options" (Haapea et al. 2023). Miksei's CityLoops team has suggested an open call for tenders for a long-term contract of managing specific CDW streams. New local procedures and companies on CE are needed to increase the upcycling of materials. Haapea et al. (2023) find that the major demolition contractors are quite committed to selective demolition principles.

But public procurement guidelines to enhance CE were developed: transportation, logistics, traffic services to increase usage of biogas and reduction of the amount of organic waste. From the demonstration report we learn that CE criteria in public procurement of biogas by Mikkeli as base costumer can drive the biogas market. These markets are also strongly influenced by EU directives (p. 7). The procurement guidelines related to the bio-waste sector concerning circular economy aspects, have been drawn up in direct cooperation with the city's procurement unit, and after the city's approval, they will be implemented in the city's procurements. The project has also influenced, for example, the climate program of the city and the operation of companies. (Malk et al. 2023).

A stable long term decision making culture is needed to ensure market stability, Haapea et al. (2023) write. For now the city's Building Services were not willing to radically change their procurement policy which mainly was concerned about minimizing cost, but also they wanted to avoid risks associated with unprofessional demolition contractors.

### 3.5.2. Progress Mikkeli towards circular city

Mikkeli self assesses itself as still at the very beginning for CDW (2-3), considering the huge masses of concrete and steel. From the demo report we learn that attitudes and operating culture have changed, which is reflected in the planning of future activities of the city. The goal in the new climate strategy of the city is that all soil masses and demolition materials that can be reused and/or recycled will be utilized.

The circular transition related to biomaterials had already begun prior to the CityLoops project. Available data on changes support the hypothesis that a significant increase in the separate collection of BW has taken place as a result of demonstration initiatives (Malk et al. 2023, p6). For BW: The construction of a new biogas plant was planned for the city and the first biogas-powered waste trucks had been purchased. The demonstration actions were designed to address the most critical challenges (Malk et al. 2023, p13). For BW they are now very much circular, 8-9 (out of 10). There's still a gap in the collection of households: still 30% of BW ends up in the mixed waste. They are using this BW together with sewage in biogas production.

This progress suggests that indeed the progress assessment in terms of BW CE with a mark 8-9 is realistic. A question is whether the effect of use of organic matter for biogas instead of returning it to the soil will not have very negative effects on soil life! The molecule structure of organic matter is quite different from that of the residue from the biogas plant.<sup>75</sup>

### 3.5.3. Economic context Mikkeli

In Mikkeli the municipal budget is shrinking. The general trend of citizen numbers is shrinking. Although last year there was +30 persons growth. It is a problematic situation. It does influence the process to circularity, according to the respondent. In the demonstration report we read that the GDP of the region is the second lowest of all regions in Finland. Agriculture and forestry are important in the region. Employment is mostly based on services with a low percentage of industrial jobs and a high percentage of jobs in the public services (e.g., education). There is a lack of employees, there are not enough young people to do the jobs, while there are big challenges. The respondent suggests that among the many people still in the emigration centers, from 2015-2016 many are not participating in the society, from Syria, Ukraine. This offers an opportunity to get employees from there. Another opportunity is that with the non-expensive schooling system they could try and keep the numerous foreign students in Mikkeli.

The city commissions Miksei development company and Xamk University of applied sciences. The company Miksei has to apply for projects and it are one or two, exceptionally

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<sup>75</sup> Soil quality is improved with the use of organic fertiliser due to its long-term soil reclamation properties such as: ability to reduce disease and pests, promotion of higher yields of agricultural crops, high presence of micro-organisms that contribute to break the organic matter into humus, ability to improve soil structure and shelf life, reduction of the loss of nutrients and improves soil tilth to permit better root growth (ACARP 2020).

4 years projects. And after that the city doesn't have money to continue with their own budget. This makes it difficult, because with each new project you have to develop something new.... They try to arrange for some continuity with the project proposals. It would be much better if the city would be more rich. Also Xamk is jumping from project to project. It is not a long period development.

### **3.5.4. Physical context and spatial planning Mikkeli**

Mikkeli is a city of 53 000 inhabitants, 230 km northeast of Helsinki. It is the capital of the South-Savo Region. The population has been stagnant or slightly declining since 1980. The municipality is very popular as a summer house location, hosting more than 10 000 summer houses. The municipality covers an area of 3230 km<sup>2</sup> including 680 km<sup>2</sup> of waterways. The population density is 20,5 inhabitants per km<sup>2</sup>. The urban centre is not very dense, and the vast rural area is sparsely populated (demonstration report). The companies who could process CDW find the margins too small for Mikkeli area, even though it are still hundreds of thousands of tons of CDW. The officer thinks it should be enough for a company that collects material on national level or in a big part of Finland and not in Mikkeli only. For normal, not circular construction, concrete elements are transported over hundreds of kilometers, so the officer wonders why it should be different for circular products and doubts the hearsay that the regional market for circular CDW is less than 100 kms. He finds it not very science based. Haapea et al. (2023) write that the CityLoops team was active in market engagement with the private companies that could have a role in the circular demolition. The potential for such business promotion in a city of 50 000 inhabitants is however not big and the market engagement activities attracted only a few local companies. Bigger companies came from elsewhere in Finland. From the demonstration report (p.6) we learn that in order to establish a cost-efficient service for both service provider and customer, it is necessary to implement different service models for separate bio-waste collection based on population density. In bio-waste collection, the form of living and the density of living have a great influence on what kind of bio-waste collection model would be best suited for the resident. In the area of apartment buildings, bio-waste collection is generally handled in a resource smart way (Malk et al. p39).

MIKKELI								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>76</sup>	Concrete elaboration <sup>77</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>78</sup>			
	– <sup>79</sup>	+ <sup>80</sup>	+ <sup>81</sup>	+ <sup>82</sup>	++			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	+ <sup>83</sup>	+ <sup>84</sup>	++ <sup>85</sup>	++ <sup>86</sup>	+ <sup>87</sup>			
Resources	Capacity municipal officers towards CE <sup>88</sup>	Use of automated data generation CE	Other tools <sup>89</sup>	Financial resources <sup>90</sup>	Storage facility			
	+ <sup>91</sup>	– <sup>92</sup>	+ <sup>93</sup>	– <sup>94</sup>	+ <sup>95</sup>			
Formal and informal rules	Political willingness (council, exec. board)	Willingness in city offices	Use public procurement to promote CE <sup>96</sup>	Local regulations <sup>97</sup>	Nat. legislation <sup>98</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>99</sup>

Table 1 - Context, demonstration actions and suggestions for Mikkeli

<sup>76</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>77</sup> Of CE policy or carbon neutrality policy

<sup>78</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics, putting CE to the background

<sup>79</sup> The political parties Sept. 2023 in a workshop have stated that CE development is important. CE is mentioned in city strategy (info KH 20 sept. 23).

<sup>80</sup> Climate ambition CO2 neutrality 2035, Climate program Mikkeli

<sup>81</sup> In 2022 new climate program came with clear goals, actions and indicators for the CE, including the bio-economy. CDW policy is more new but now projects are under development and city takes CDW in account as well.

<sup>82</sup> The development in 2023 has been positive, and Mikkeli has even started the circular economy days -action, that includes many participants

<sup>83</sup> Employees of City of Mikkeli and public waste company Metsasairila cooperated in demonstrations (info Haapea, 19 sept. 2023). In general Better coordination is needed between environmental authorities and building permit authorities and the units implementing public procurement (Haapea et al. 2023)

<sup>84</sup> August workshop Miksei development company with politicians on decision making (info Haapea sept.2023)

<sup>85</sup> using the service design method, project stakeholders and Mikkeli residents were involved in workshop 2021 identifying potential barriers to separate bio-waste collection, representing various lifestyles. Ambition to include CE in vocational curricula

<sup>86</sup> Entrusting development upon public company Miksei, or to companies in Ecosairila hub on water technologies, while city is short of public budget.

Commissioner-contractor relation! The employees of City of Mikkeli and public waste company Metsasairila were cooperating and involved in demo phase

<sup>87</sup> E.g. Xamk, Miksei, hired expertise

<sup>88</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>89</sup> E.g. LCA, 3 D tools, soil balance tool, data collection on Solid waste streams, etc. that support facts and figures based decision making

<sup>90</sup> National subsidies for BioWaste collection and biogas plants are multiple. Municipal budget is shrinking.

<sup>91</sup> 2023 the situation has improved (info Haapea 19 sept. 2023)

<sup>92</sup> For CDW a databank incl. demolition sites, material lots, and materials has been developed, using guidelines from the national Ministry of Environment. however, limited compatibility with other systems such as the marketplace. Need for a more advanced system. For pre-demolition audit software was developed using CityLoops guidance.

<sup>93</sup> CO2 calculator Roskilde has been tested for concrete, soil and mixed CDW by the semi-public Xamk and Miksei companies that are (co-) owned by Mikkeli

<sup>94</sup> Biogas progress is supported by Finnish subsidies

<sup>95</sup> Storage of materials is referred as a problem for the dental clinic demonstration. Also specific room for waste bins in apartment buildings is an issue. But considering the low density of Mikkeli buildings we presume it is not a major general challenge for the city when it comes to outside storage of masses.

<sup>96</sup> Referring structural use only, so not if only in the demonstrations

<sup>97</sup> Does the city or region make use of local regulations to support CE?

<sup>98</sup> EU Waste Framework Directive is setting targets for the MSs. By 2025, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 55 %, 60% and 65% by weight by 2025, 2030 and 2035 respectively; 70% weight CDW reuse, recycling or other material recovery for 2020.

<sup>99</sup> Different from willingness which means going into action as well!

	+100	-+	+101	-+102	+103	all 4 types	+	+104
Economic context	Keeping the area attractive for youth, and employment promotion are a challenge. The municipal budget is shrinking due to shrinking population and local economy.							
Physical context	Mikkeli city covers a vast area and is generally sparsely populated with the exception to some high rise housing area. Remote position in a region with many lakes and rivers.							
HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS? AND WHAT COULD BE DONE TO FURTHER PROGRESS								
<p><b>In general:</b> substantial steps are made that help stimulate and nudge towards CE, also as result of the CityLoops project. See outcomes for demos below. Interoffice cooperation like by instalment of targeted interdepartmental cooperations (as in Bodø) could maybe help tackle the specific challenges referred in terms of immature market, differences in operators, and limited room for them to manage waste in an correct and financially interesting manner. Haapea et al. write that better coordination is needed between environmental authorities and building permit authorities and the units implementing public procurement. Advance in data management for CDW is desirable as well for CDW management. Efforts were made but compatibility of sub-systems of the CE is a challenge to tackle. Improvement can support Monitoring and Evaluation in favour of fact and figures based decision making and identifying required actions. The obligatory BW collection may be born out of interest to support the biogas plant with fuel. For the sparsely populated areas it could lead to deterioration of soil fertility by loss of organic matter. NB wood from constructions is not included in the BW demonstration but in the CDW demonstrations.</p>								
Circular demolition 2 health buildings	<p>Outcome: better coordination needed between environmental, building permit and procurement offices (Haapea et al. 2023). Substantial effort in communication with companies has lead to more awareness at their level. However there is a client-server relation with companies. Role definition can maybe lead to more effective cooperations in CE. Material market supportive to new CE practice, also by citizens. How will it be managed after CityLoops?</p> <p>The policy goals need to be translated into institutional change and adopted as new practices in all relevant departments. (Haapea et al. 2023)</p>							
Action research decision making								
BW collection and sorting	<p>Lack of awareness and motivation among citizens, as well as inadequate access to apartment-specific bio-waste bins and waste bags, hindered adequate separate bio-waste collection (Malk et al. July 2023). The intensive cooperation and exchange of information in a creative and group specific manner has raised the awareness among citizens of all ages and life styles. Physical context influences the demo-actions. In the area with detached houses, one of the most affordable bio-waste collection models is for residents to have their own bio-waste composter. In densely populated residential areas, it is recommended to set up block collection points for bio-waste and other recyclable materials. This is an affordable collection service for the residents as well as cost-effective for the waste company. (ibid)</p> <p>Separate household biowaste collection is a challenge in sparsely populated areas. Even though it is obligatory according to local rules.</p>							
BW treatment biogas incinerator: pilot lab scale	<p>Separate BioWaste collection support biogas policy and provide the local plant with fuel. However, it may have a negative impact on soil health when continuously all biowaste is incinerated. Fertilizers from digestate do not have the same complex molecule structures as organic matter has that contributes to soil life. Fertilizers do not replenish soil fertility in a sustainable manner.</p>							

<sup>100</sup> Situation has become more positive last year. Mikkeli has even started the circular economy days -action, that includes many participants, and also the political parties have stated in a workshop in Sep 2021 that CE development is important (info Haapea, 20 sept. 23).

<sup>101</sup> For various materials, including CDW and BW, 25% of procurement (in finance) should be circular in 2025; reversed tendering could be used in demolition contracts: price is fixed, and awarding based on the quality of circular solutions proposed by the contractors.

<sup>102</sup> According to the regulations of the city, bio-waste must be sorted separately from mixed waste also in private households. A hindering legislation is that CDW waste is to be delivered to the public company Metsasairila which implies that market parties such as "recycling operators" can not engage in stripping the building and marketing materials (Haapea 2023).

<sup>103</sup> Demolition permit obligatory, on submission estimate of the types of waste generated and plan for their management. usable objects and substances to be recovered and reused, organizing separate collection for eleven types of waste, Target 70% 2020.

<sup>104</sup> 80% Finish population in favour CE, but lack of knowledge and motivation hindered adequate separate bio-waste collection. Malk et al. advise creative and unconventional information campaigning.



## 3.6. Porto

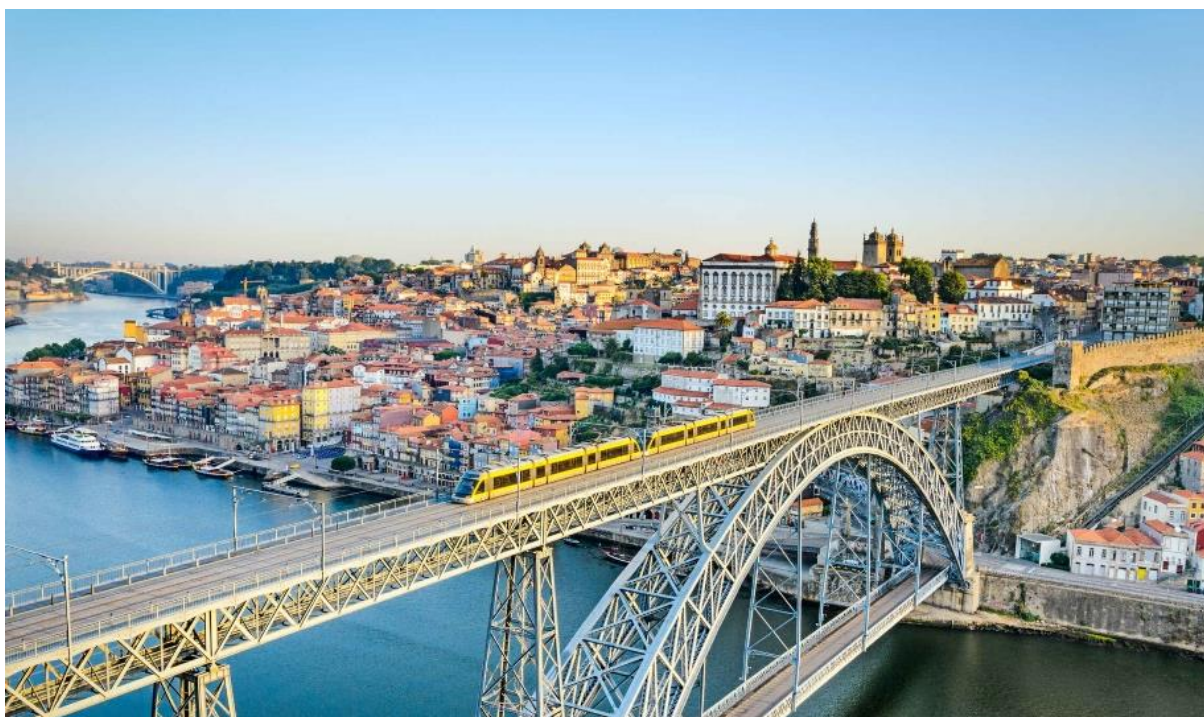


Figure 14 - Bridge over Douro in Porto city

### 3.6.1. Political and policy context Porto

#### 1. Policy content

For Porto, carbon neutrality is the main ambition. Beginning 2022 the city launched the 'Porto Pact for Climate' towards carbon neutrality through collective action for collective benefits. With it Porto was selected by the European Commission to become one of the 100 intelligent carbon neutral cities, and to build resilience against the impact of climate change by the Adaptation to Climate Change Mission. The respondents believe that reaching carbon neutrality also tackles a lot of other sustainability issues in Porto city.

The officers mention explicitly the long-term Municipal Strategy for the Environment and the Roadmap for a circular city by 2030 as helpful to implementation of the demonstrations. The environmental strategy focuses explicitly carbon neutrality; resilience of the city in terms of food, quality of life and less dependency on for example energy imports; and a just, fair and equitable digital transition. The CE roadmap focuses on sustainable production and consumption; circularity and extension of materials life cycle, natural resources preservation and environmental balance; closing the materials cycle and regeneration.

Porto Municipality, Porto Ambiente (municipal waste collection company), LIPOR (inter-municipal waste management company) and 2GoOut Consulting together executed five BioWaste demonstrations: Selective BW collection and local treatment model; BW circularity



in the tourism and social sectors; the Launch of a green space certification system; Circular entrepreneurship initiatives; and Reducing food waste by a donation network.

## 2. Cooperations/parties involved

In terms of internal cooperation within city offices, a challenge is to overcome the departmental structures and barriers. It needs extra attention. Every department has its own priorities and way of managing and acting, Porto Ambiente is no exception to that. In this way they also sometimes do not recognize how important a project is to another department. They assume this also happens with their circular projects in other departments. This could be identified in the implementation of the Demonstration action 3: Launch of Green Space Certification System and of the Demonstration action 5: Reducing food waste via a food donation network.

The demonstration actions have citizens and/or companies participating.

The compost islands-project (demonstration 1) is only possible with the participation of the citizens. Citizens were targeted with awareness raising actions, but there was also cooperation with local associations of youth and of neighbourhood residents. A local Compost Master was appointed, as a paid position. This master formed the link between the participants and the equipment, the main contact for doubts and the proximity person that inhabitants relate to. An event was organized to celebrate the first compost produced, hosted by Porto's Vice Mayor Filipe Araújo and all the participants were invited (Claro et al. 2023). For the community composting demonstration locally promoting workshops and/or door to door explanation on composting were organized. The goal was to encourage residents to start the process in their own neighbourhood. After the workshop, each household received a flyer, a magnet, and a caddy, plus the possibility of receiving *in loco* or remote support, if any doubt would occur. More than 120 families are using the composting islands even though the projects has only been launched in 2021. In 2021 Porto municipality launched a sensibilization campaign to get people participating.

On the organic waste collection, the collection of organic waste with intelligent bins also depends on the citizens. With the implementation of the proximity intelligent bins, around 26,500 families are actively participating. This way of collecting organic waste is maybe so successful because it is easy and maybe people feel special about the smart card to use the bins in the street. For the household BW collection an 8 months awareness campaign with door-to-door activities, street activities, using a mascot to attract the young, campaigning in the supermarkets while including itinerant structures with informative counters were held. The supermarket campaigning was later on assessed less ideal as approach (Claro et al. 2023).

Under demonstration 2, promoting biowaste circularity in the tourism and social economy sectors, Porto municipality also works together with the private sector, with the guidance of LIPOR - the public company funded by 8 municipalities, including Porto Municipality. They work with a hotel in Porto and with the canteen of the Municipal Solidarity Restaurant Network, in order to implement circular measures that are being developed under CityLoops project (circular models). The food needs are identified and a set of measures along the biowaste life cycle are proposed to prevent food waste.

As comes to demonstration 3, the “ Green Space Certification System was drafted, presented by LIPOR, and discussed with Porto Municipality’s environmental and green spaces services. It was redefined in order to enhance the acceptance of all the stakeholders (citizens and municipality gardeners). After this discussion the system considered three important categories that sustainable green spaces must pay attention to: 1) the User, 2) Water and Nutrients recirculation and 3) Biodiversity and Landscape” (Claro et al. 2023, p36). The involvement of users seems mostly a form of user information, not information by users. The purpose of the Green Space Certification System is to stress the importance of sustainable green space management, through the adoption of good practices for the promotion of biodiversity, the maximisation of benefits provided by the ecosystems and the recognition of spaces where these topics are already being addressed, so that citizens can appreciate and benefit from more natural spaces in urban areas (Claro et al. 2023). The officer expects that certification of green spaces could be applied to private organizations that own green areas. Beyond the large municipally owned and managed parks and gardens, there are many green spaces in the city that are owned by private parties.

Under demonstration 4, the municipality of Porto issued an open call for ideas to the FoodLoop contest. They addressed anyone - citizens, organizations and companies - that wanted to scale up a pilot or circular solutions to contribute to a circular and regenerative food system at Porto. The call mostly aimed at citizens. The municipality received 21 applications, of which 19 teams went through a bootcamp process, 5 winners received mentorship to develop a sustainable and positive impactful business model and identify financial opportunities to be implemented, with the partnership of the private sector in CE, social economy and impact economy.

For the contest to promote a circular and regenerative food system ([www.foodloop.pt](http://www.foodloop.pt)), Porto Municipality joined forces with experienced people in entrepreneurship, social economy and CE to develop the contest model. For the realisation of the contest, a multidisciplinary jury was constituted with expertise in different areas of the food sector, entrepreneurship, economy, environment and social areas, and with internal and external stakeholders of the municipality of Porto. It included business school, university, social and environmental department head of the city. It included ideation workshops for students. The city will train/mentor the best 5 applicants from the 21 ideas to develop a circular business model ([www.foodloop.pt](http://www.foodloop.pt)). The training included masterclasses on funding possibilities such as European funds in the social and environmental sector; tips on how to apply; and on communications, partnerships and negotiations.



*Figure 15 - Launch by Porto's vice mayor of the mentorship program for the winners of the contest (photo: Sara Pinheiro Velho)*

Within the food donation network (demonstration 5) the private sector is the main donor, giving away their food surplus. In this demonstration action 144 tonnes of food waste were avoided, resulting in the prevention of 604 tonnes CO<sub>2</sub> eq emissions. Porto Municipality (involving municipal services related to municipal, social and school canteens and to events promoted by the municipality and other events dependent of municipal licences) but also small, medium and large companies are food donors such as: restaurants and similar, hotels and companies in the wholesale and retail sector. Social organisations are involved as receivers, so that they can redistribute food with quality to citizens in unfavourable living conditions.

With the CityLoops local collaborative network they aim at bringing together people, organizations/ companies and municipalities from Porto metropolitan area who are interested in applying circular food systems. They try to connect people, disseminate the demonstration actions, support their implementation and prevent/reduce food waste. The private sector also participated in the circular procurement workshops in Porto.

The officers find they can mobilize companies, organizations and institutes, but find it difficult to really transform to circularity. Each party has its own priorities. Sometimes the external parties seem to wait for the municipality to move to action or progress on transforming to

circular practices and support CE. During the quick scan the officers mentioned that the fact that Porto city is the main actor of collection and LIPOR, the main treatment company of waste in Porto helps the demos. The city owns the waste company and is one of the Municipalities that founded LIPOR.

### 3. Resources

Sustainability of the projects, to continue circular projects, is considered a challenge. For the first period there usually is funding, but how to fund the projects after that? How to create sustainable business models for the demonstration actions?

A second challenge in terms of resources is that sometimes there is no data available that they need for a project, monitoring systems are not optimized or implemented, or they first need to set up a new way of monitoring. This is a general issue for innovative projects. This data collection is organized along the different departments, but now it is a priority to integrate data from different departments (goal 3, on digitalization). They try to bundle the data in one database with indicators to use as sentinels for their work. The departments feed this common database. Currently, they produce their first local voluntary report on the Sustainable Development Goals. This is an example for a set of indicators for the whole municipality that they need to connect with databases from other departments. They can use it as an internal exercise. And later they can talk to stakeholders about it, when it is made more robust. They were working with the Joint Research Center/CE to develop indicators on the progress of Porto to comply with the Sustainable Development Goals.

One of the innovations in terms of internal staff resources was the establishment of the person responsible for the community composting sites: “Compost Master”. This was a step to recognize the importance of this figure to the success of this type of solution (Claro et al. 2023 p53). Claro et al. provide details on the economic costs of the demonstrations, distinguishing material and staffing.

### 4. Rules

As concerns political willingness, the officer referred during the quick scan that the local administration of the city is committed to the development of actions for the CE. Claro et al. (2023) find that political commitment is fundamental on key moments to reinforce the importance of CE on the team and on the region.

But the interviewed head of the environmental management office is concerned about the understanding within the offices and politics of what circularity is about. Since 2018 the department is responsible for the CE and implementing the roadmap to a circular Porto by 2030. The understanding of circularity is improving but not yet shared among all layers and sections of the municipality. The officer is experiencing an enabling environment for circular actions, at the level of the City council. And at the level of the Mayor and Councilors circularity is a priority. The office did not have any process or initiative that was not approved by the council. Also circular initiatives launched by other departments/services, for example from Porto’s Center for Social Innovation, are approved by the other city councilor – in charge of projects from citizens and business.

In terms of willingness within the offices to reach CE, in Porto the officers connect the strategic ambitions on carbon neutrality, resilience and quality of life to circularity: Local solutions for food and energy systems automatically mean that they design optimized utilities and resources use. They try 'to make the most out of every resource' they have in the city. Also the digital transition links to dematerializing processes, meaning doing more online, e.g. online services for citizens and less printing.

As concerns ways of decision making, the respondents refer to the open mind of the organization and the vice mayor in decision making processes. The routes to decision are different, depending on the idea taken. If in the Environmental Planning and Management Department a staff member - sometimes triggered by a citizen or external organization – identifies a need or opportunity which is in line with current policies, they usually go ahead and make technical analysis and an analysis of costs and benefits. They take this analysis to the head of the department (first bottle neck) and then to the vice mayor as political representative. The vice mayor is also Councilor for the Environment and Climate Transition. The environment officer and head of the section discuss the idea with the vice mayor during the regular 2 monthly meetings. Sometimes an idea comes from the vice mayor himself, mainly via citizens. The vice mayor asks the technical staff if the idea or opportunity is feasible.

If an idea or opportunity is out of the box, there is also the possibility to first check with the decision makers in order to see if they proceed and how. Staff and politicians are very eager to grab opportunities and too optimistic and need to refrain themselves and think practically.

The organization is not very hierarchical and technical staff can take the initiative to talk to political representatives. In some situations there may be the need for approval by the political Executive and/or the Municipal Assembly (according to the project typology and financial weight). The city works with an annual strategy and tries to match the opportunity with the strategy. If it doesn't match they can't participate.

For more strategic topics they try to bring in colleagues from other departments, for example when preparing the application for the 100 intelligent and carbon neutral cities, and they cooperated with the vice mayor. So, there is opportunity to co-creation of ideas and proposals between several municipal units, including municipal companies. It can be a dynamic and iterative process. That's common practice in Porto. Similar view was given during the quick scan: officers are stimulated to cooperate with other city departments.

In Porto all four styles of decision making apply, depending on the issue and context. There is a strong tendency to knowledge-based decision-making, although sometimes the facts and figures are not readily available, especially for innovative topics. The medium- and long-term Municipal Strategy for the Environment includes the pillar 'Porto as a lab-city' that is open minded, tries and tests out new things, and encourages entrepreneurs to create products and solutions to solve real challenges to improve quality of life. The strategy also includes the pillar 'Porto as an analytical and transparent city', to produce, monitor, analyse, encourage research and share information with others, and at same time support municipal choices (<https://ambiente.cm-porto.pt/files/uploads/cms/ambiente/44/files/1613665758->



[bw3S7s1xgc.pdf](#); <https://ambiente.cm-porto.pt/ambiente/estrategia-1>). This open minded spirit is very enabling for pilots, including the demonstration actions.

A rationality is observed in the implementation of the BW circularity models that will follow a 5-steps methodology, from a 1) diagnosis phase, to 2) strategy and action plan, to 3) implementation and awareness raising, via 4) measuring of impact to 5) recognition and celebration. Another example is the participant regulation that was created, presenting the participant conditions and the eligible topics for the contest. Planning is key and bio-waste management needs to be a key factor in urban planning and design, defining specific areas for public spaces to have waste collection and/or local treatment, Claro et al. (2023) find.

In Claro et al. (2023) we observe that it is a city standard working practice to use GIS and other data, even open source, to support decision making and management. Facts and figures are important resources for decision making in Porto.

Willingness citizens: The people in Porto in general are aware of sustainability issues. There is a gap between awareness and action (according to several studies, too), because people may be aware but don't know what to do when they are outside the sustainability-bubble or have resistance to do things differently than what they've always done. Within the municipality they sometimes don't focus enough on the solutions, the officer thinks.

Willingness of companies to contribute to CE: the interviewed officers think that big companies are concerned about circularity. Some companies seem to do it because of environmental considerations, too. For big companies it is not enough to become circular only because of 'doing good' or 'looking good', there also has to be a financial plus. On the other hand they have to move towards circularity because of public opinions. In areas with strong textile sector you see collaboration to use surplus material and waste of other companies. In the distribution sector we see initiatives to use food that is not always fit to sell in the supermarket (e.g. banana bread made from "old" bananas). There are also small companies and start ups that base their activities on circular business models. The municipality's environment department challenged citizens and organizations to pledge for climate neutrality in 2030 to lever actions in others. They received 170 pledges, most of big companies who now also want to show the municipality their strategies. There seems to be a lot of work done, but people need to share who is doing what to get inspired and to get together. During the quick scan in 2021 the officers from Porto found that it are cultural issues that hinder most the progress towards a circular economy in the city.

Concerning legislation: All demonstrations (Fig.2) are framed by national policies: (food) waste, circular, carbon neutrality, biodiversity etc. There is nothing that hinders the implementation, the environment is enabling. There are no local regulations that hinder, they have to comply directly with national laws. Example of a limitation is the issue of sustainable procurement. It are EU laws on competition that create difficulties when the office wants to for example only buy locally or with sustainability criteria. (see WP5 (on public procurement, e.g. canteens). But from the demonstration report we learn that the Smart Collection System tool concerning household biowaste in smart collection bins, based on a mathematical model, was not developed due to data protection laws conditioning information sharing. 'Sustainable procurement criteria are used in tendering procedures by the city (Claro et al. 2023). Circular Procurement allows to create a systemic change through public purchasing. The commitment



and the engagement of the board and of the purchase departments is of fundamental importance to succeed on the implementation of these circular procurement practices' (Claro et al. 2023, p 55) According to the quick scan - the advance in meeting European recycling and recovery targets however supports the demonstration actions.

### **3.6.2. Progress Porto towards circular city**

As concerns the self-assessed progress towards becoming a circular city, Porto officers give the city a 3. They find that they still have a lot to do to be fully circular. They do a lot already, but the projects are only in pilot stages. They need to scale up and do more.

### **3.6.3. Economic context Porto**

After an interruption of growth in the value generated by the municipality - due to the costs related to the pandemic in 2020 - Porto recovered in 2021. Now there is a slight economic growth. Also in Porto the understanding is that – though in general, a good financial situation can accelerate and guarantee the continuation of projects - the CityLoops projects are not very sensitive to economic downturn, though. The ones related to food waste management may be sensitive at a certain point, but they have also experienced more solidarity in economic tough times. So it is difficult to predict how the economy influences the food waste management demonstration action. The other demonstrations need less financial support and are therefore less sensitive to decreasing budgets.

### **3.6.4. Physical context and spatial planning Porto**

Porto officers referred to physical characteristics, such as Porto's characteristic urban tissue, with different densities and space. It holds dense and narrow streets in the central and historic part of the city, less dense and wider streets on the coast, and streets with a more rural character in the eastern part of the city. Accessibility issues in the historic center and city center, some steep slopes in the city center and proximity to the Douro river condition the implementation of any solution/action at the Porto territory. The composting islands are being implemented only in low-density residential areas. And smart containers are being implemented in high- rise/density residential areas because buildings in these areas do not support door-to-door collection.

Another example is that Porto Center is a commercial and cultural historic city<sup>105</sup> and touristic which implies a very heterogeneous waste production profile throughout the year and of a specific typology. Being a small (41,42 km<sup>2</sup>) and densely urbanized municipality, Porto does not have a pronounced food production area, only small patches of family farming in reduced areas and some urban vegetable gardens. This conditions the city's food supply, and its food

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<sup>105</sup> classified as World Heritage since 1996.

autonomy - which is mainly supplied by large food supply chains. It conditions the proximity to larger capacity food producers, located in the peri-urban area outside the administrative limits of Porto. This makes it difficult to promote local food production and use of sustainable food under the application of the circular models of demonstration action 2: promoting BW circularity in tourism and social economy through circular models. Many green spaces in the city are privately owned.

As concerns the CDW actions, the need to renovate much of the city's pipeline infrastructure supports the demonstrations.

PORTO								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>106</sup>	Elaboration of CE policy in program with concrete targets and actions	Roles multiple parties defined in CE policies	Competing other policies <sup>107</sup>			
	++	++	-+ <sup>108</sup>	+ <sup>109</sup>	+			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	++ <sup>110</sup>	+ <sup>111</sup>	+ <sup>112</sup>	++ <sup>113</sup>	++ <sup>114</sup>			
Resources	Capacity municipal officers towards CE <sup>115</sup>	Use of automated data generation CE	Other tools <sup>116</sup>	Financial resources	Storage facility <sup>117</sup>			
	++ <sup>118</sup>	+ <sup>119</sup>	+ <sup>120</sup>	-+ <sup>121</sup>	122.+			
Formal and informal rules	Political willingness (council, exec. Board)	Willingness in city offices	Use public procurement to promote CE <sup>123</sup>	Local regulations <sup>124</sup>	Nat. legislation <sup>125</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>126</sup>
	++ <sup>127</sup>	+ <sup>128</sup>	-+ <sup>129</sup>	+ <sup>130</sup>	++ <sup>131</sup>	all 4, most fact & fig. based	+ <sup>132</sup>	-+
Economic context	Slight growth of the economy after a small decline during COVID. Centre of Porto metropolitan area.							
Physical context	Small (41,42 km <sup>2</sup> ) and densely urbanized municipality with 232,000 inhabitants (2021 census). Dense and narrow streets in the central and historic part of the city, less dense and wider streets on the coast, and streets with a more rural character in the eastern part of the city. Accessibility issues in the historic center and city center. The composting islands are being implemented only in low-density residential areas. Smart containers are being implemented in high- rise/density residential areas because buildings in these areas do							

<sup>106</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>107</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics, putting CE to the background

<sup>108</sup> Roadmap sets a transition vision up to 2030. Quantitative and ambitious targets have not been formally updated since 2017 and are not detailed beyond 2020.

<sup>109</sup> Roadmap sets roles of parties with its governance section and counted with stakeholders contributions to define CE vision and strategy. Also based on good involvement different types of stakeholders in the demos, there is a structural approach to stakeholders in policy formulation, but not yet in implementation.

<sup>110</sup> Officers are stimulated to cooperate with other departments.

<sup>111</sup> E.g. vice mayor celebrating first compost produced. Technical staff can contact politicians, via the hierarchical lines while organisation is not very hierarchical.

<sup>112</sup> Well developed approaches to stakeholder involvement in policy development, but not yet in the implementation of policies. Center for Social Innovation enhances role citizens and social organizations. Insights on how to keep the social network involved ('feedback is the key for involvement motivation and the success of the initiatives')

<sup>113</sup> Sound collaboration with companies and social organizations. Launch entrepreneurship competition stands out compared to other cities.

<sup>114</sup> E.g. with JRC and EMF, many different expertises have been involved in the demonstration actions

<sup>115</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>116</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>117</sup> Whether storage facilities are structurally assured within the city's urban tissue for CDW and BW projects.

<sup>118</sup> Try to make the most out of every resource / piggyback riding, open minded and city-lab pillar. Analytical attitude, see demonstration report.

<sup>119</sup> Working on it with e.g. JRC and combining towards measuring SDG impact. It is standard to use GIS and other data and monitor impact.

<sup>120</sup> Monitoring of impact. Currently, they produce their first local voluntary report on the Sustainable Development Goals. This is an example for a set of indicators for the whole municipality that they need to connect with databases from other departments. Porto has already a public Porto Open Data and is working on a unique and more complete internal Monitoring Data Base for technical and political support decisions.

<sup>121</sup> After decline during Covid, slight growth of city budget. After a project is finished there's no provided budget to continue some of the demonstration actions.

<sup>122</sup> Demonstration report refers the lesson learned that in urban planning space needs to be included for circular use BW collection and circular treatment

<sup>123</sup> Referring structural use only, so not if only in the demonstrations

<sup>124</sup> Does the city or region make use of local regulations to support CE?

<sup>125</sup> Is there specific national legislation that supports or facilitates local CE policies or actions? E.g. end of waste crit.; strategy green CE, public role waste

<sup>126</sup> Different from willingness which means going into action as well!

<sup>127</sup> 'Not one CE initiative that hasn't been approved by the council'. But there are concerns about understanding the CE is more than 'waste management at the end of the lifecycle'.

<sup>128</sup> Other municipal services (Economy, Social, Education, etc) less aware of importance CE; Concerns about understanding that CE is more than waste management at the end of the lifecycle. Needs more time to implement the sustainable procurement policy and make it mandatory.

<sup>129</sup> A municipal task force and an approach are being defined to the development and implementation of a Municipal Sustainable and Circular Procurement Policy (Claro et al. 2023, p60)

<sup>130</sup> Not referred. But Porto follows national legislation which is enabling. Certification Greenspace is a form of local regulation of quality.

<sup>131</sup> All demonstrations are framed by enabling national policies. EU law on competition however is hindering when office wants to for example only buy locally or with sustainability criteria. The Smart Collection System tool concerning household biowaste in smart collection bins, based on a mathematical model, was not developed due to data protection laws conditioning information sharing.

<sup>132</sup> Willingness to act is high, but at the same time reference to lack awareness of extended producer liability among companies (result quick scan). Sometimes wait for municipality to take action.

	not support door-to-door collection. (Claro et al. 2023). As concerns CDW, the fact that renovation of water pipelines was needed was a reason to include it as a circularity demonstration action.
<b>HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS &amp; PROGRESS TOWARDS CE? AND WHAT COULD BE DONE TO FURTHER PROGRESS</b>	
<p><b>General:</b> Strong policy document with roadmap to a circular Porto based on a sound analysis supports the demonstrations and the soundness of actions. Experts involvement contributes to sound roadmap and fact and figures based approach. Targets of the roadmap to 2030 circularity are detailed up to 2020 and since 2017 there has been no public update. If there is no update, there is no understanding and concrete measurement of the progress of implementing a circular economy in Porto. This would be needed in terms of increased quantitative targets and specific actions and timing.</p> <p>Institutionalization of stakeholder involvement in policy formulation. It is common practice to involve them in roadmap, climate change plan. Always as a way of doing. Within Porto economy, on the strategic level. In the implementation they need to be more involved. Now a bit more theoretical. Also in procurements. Porto is in the beginning of real involvement in implementation, i.e. in cooperative practice.</p> <p>Important to insist on continuing awareness raising about the meaning and importance of CE and applying an even more transversal approach, targeting citizens, companies and city offices. The respondents (Environment department based on consultation with Nutrition faculty) mention that the national TV and other social media still mostly promotes unethical consumption and should support a real more sustainable production and consumption, and give more time in prime times to these matters.</p> <p>Good steps are being taken to use automated data and the monitoring and evaluation approach to SDG can be furthered. CE budget of the city requires attention in order to avoid loss of momentum on the way to CE. Attention needed to the role of storage locations within the urban tissue for CDW and BW mass in order to avoid transport emissions and support circularity.</p> <p>Possibly local regulations can be looked at as means for transition and institutionalizing CE and consultation practices (e.g. example vocational curricula including CE like in Mikkeli). This may be especially relevant for the regional upscaling ambition. Nice broad variety in BW actions which helps tackling several dimensions of CE, although some of them are still pilot initiatives (as is the case with community composting islands and the circular enterprise initiatives). Institutionalization of circular procurement as a transversal municipal policy is still to happen. Could engagement with the social affairs department help to further progress in terms of awareness and stakeholder involvement, tailoring to users. Making the social department into a partner would depend from involvement and willingness of politically responsible persons to let the social department cooperate on CE. It is a matter of full agendas and competing topics There is no service with the mandate to include sustainability in all departments. It will be an external company that will develop the sustainable procurement policy and support its execution. The process has started 2 years ago.</p>	
<p><b>Demo: BW selection and local treatment model</b></p> <p>Upscaling may benefit from awareness promotion at the level of citizens, and companies. The necessary insights are there as result of the demonstrations and experiences. The cooperative approach towards the commercial establishments and the awareness actions have succeeded in terms of their involvement in the demonstrations. Good results in terms of tonnes of waste being separated and locally treated and turned into compost. Fact and figures based attitude support sound argumentation and monitoring and evaluation.</p>	
<p><b>Demo: BW circularity models, new Circular procurement practices and training</b></p> <p>Limited understanding of the importance of a CE within the city offices and in the companies and the resistance of both parties to changing practices/procedures may make it hard to change procurement practices towards circular procurement. E.g. companies need to apply the HR to monitor, look at results, buy the local and sustainable food.</p>	
<p><b>Demo: Launch Greenspace certification system</b> Cooperation between environment and green management departments has enabled the multidimensional approach. The social affairs department has not been involved and was not identified as fundamental. Citizens' appreciation of the green space criteria defined for the sustainable certification of green spaces were not heard. It would be interesting to understand how they are accepting changes in these spaces. Possibly the local treatment compost is applied as result of cooperation with and inspiration by LIPOR. It allows a nice circular loop. In itself the certification is a form of local regulation of greenspace quality.</p>	
<p><b>Demo: Contest circular enterprise initiatives</b> The initiative is an appealing manner to engage into cooperation with societal partners. Awareness actions could reduce the need for such competition but the training component may be a good way to support market initiatives. Financial resources would be needed to repeat these trainings for new initiatives. Including it in curricula of the educational institutions, like in Mikkeli, could help.</p>	
<p><b>Demo: Reducing foodwaste by donation network</b> Enabled by the cooperation between LIPOR and Porto Municipality. Depends a lot on the cooperative attitude of officers. But also on organizations involving their catering services and on collective events with catering, and on mobilizing social institutions as receivers and hotel and food suppliers sectors as donors be part of the network.</p>	

Table 4: - Context, circularity demonstration actions and suggestions for Porto

## 3.7. Roskilde



Figure 16: - Roskilde (photo: Roskilde Municipality)

### 3.7.1. Political and policy context Roskilde

#### 1. Policy content

In 2018, Roskilde Municipality adopted an ambitious property strategy with a focus on sustainability (Kellermann and Buchard, 2023). It is among the formal policies in the municipality of which a part regards 'sustainable building'. It is containing demands on – in its present form – social, economic and environmental qualities. At present the property strategy is being ratified in a new version, where the focus is on CE, CO<sub>2</sub>, and indoor climate at schools.

The officer's strategy is to start doing small circular actions – e.g. just do it for a small building - and if it is successful then lift it out. That will be reflected in the awareness and in the questions that are being asked in the future. This way they can move things along. And if it doesn't succeed, they keep quiet. Also there is the strength of using a good narrative, e.g. for the Musicon neighborhood. They take out the synergies and use them for a new positive story, for the contractors, the advisors and the politicians.

Roskilde is currently in progress with incorporating the results of a circular soil strategy in urban development strategies and in real estate management strategies. It will be a set of levers, procedures or tools that are developed as they go, according to how to address each identified barrier. The overall bearing mark is to rank soil management in order to promote soil handling linked with the CO<sub>2</sub> load.



A concept that promotes reuse is employed in the car park demonstration action at Musicon: "Design for Disassembly". This concept "allows for easy disassembly and the potential reuse of materials in the future, further enhancing the sustainability and circularity of the building" (Kellermann and Buchard, 2023). The demonstration report speaks of the Circular Material Economy instead of CE.

Roskilde enacted three CDW demonstration actions: 1) transformation of some secondary buildings, 2) construction of two Car Parks, and 3) circular soil management. All three concern the Musicon area, a previous concrete factory and waste deposit site, containing a series of production halls. The development of the area focuses on preserving the industrial aesthetic as well as the existing buildings, to be a hub for creativity, music and cultural activities (Kellermann and Buchard, 2023).

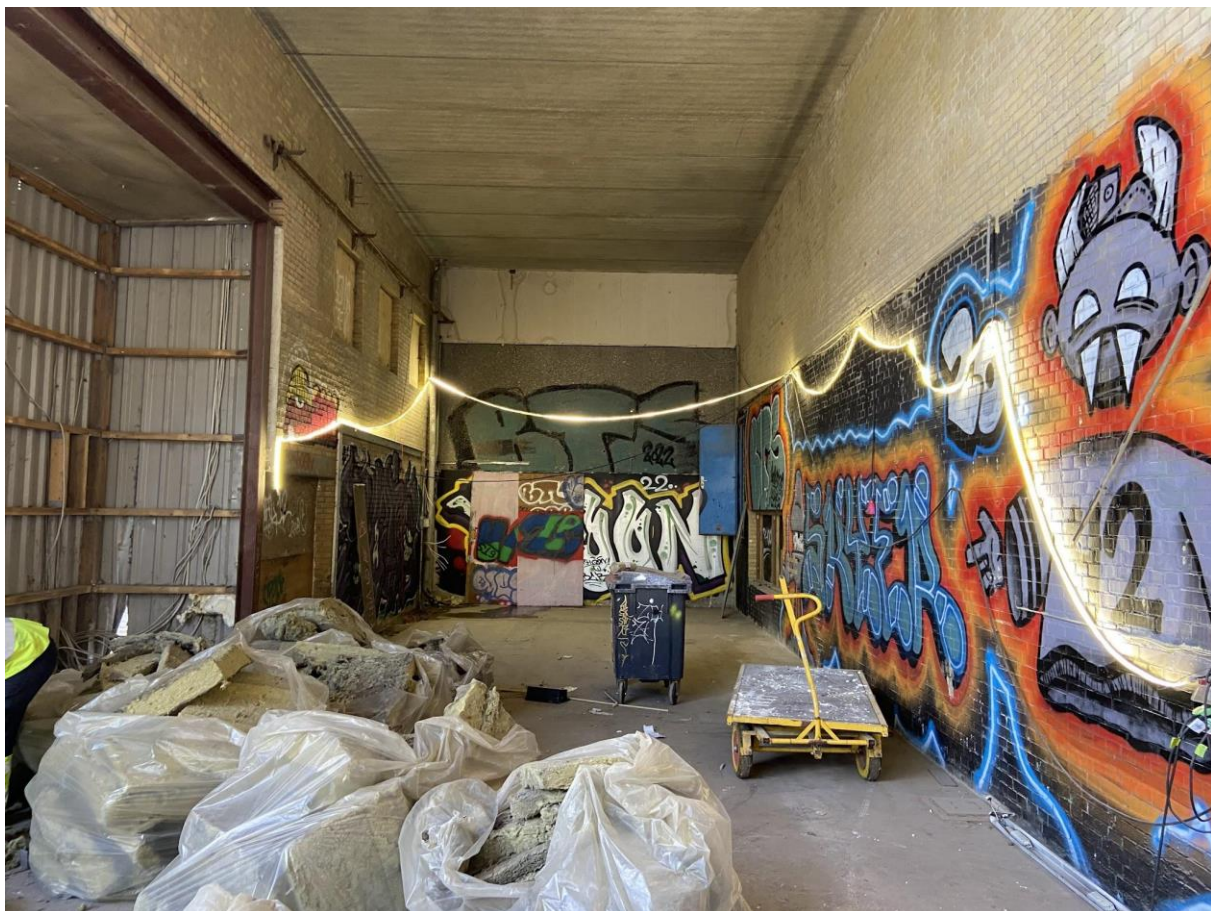


Figure 17: - Towards new use of buildings in the Musicon area, Roskilde (photo: Klaus Kellerman)

## 2. Cooperations/parties involved

Officers can play an important role in sensitizing the politicians via presentation and other ways of information on facts and figures and knowledge. See also above on the officer's strategy to create positive 'stories'. There's no direct contact between officers and politicians, however, for protection of the officers.

During the quick scan in 2021 the Roskilde representation referred to the fact that they are stimulated to cooperate with other departments, especially regarding sustainability. Within the offices of Roskilde, employees from various administrative areas form a multidisciplinary sustainability group. The group aims to promote a holistic approach to sustainability and facilitate collaboration across different fields within the organisation. They bring in diverse expertise and perspectives. This brings better coordination of resources, efforts and projects, as the group shares information, exchanges ideas and identifies synergies between different administrative areas. The group is not embedded in any already existing formal structures in the municipality. This leads to a more fluent exchange of information and more efficient decision making (Kellermann and Buchard, 2023, p33). The group also focuses internal procedures in relation to the external processes, in order to help external partners in understanding the formal procedures within the municipality structure. And they improved the handling of requests internally. “This procedure has now been tested in a couple of cases and is being ratified by the different departments in the municipality”(Kellermann and Buchard 2023).

As concerns cooperation with companies, during the pre demolition screening phase of Hall12, environmental consultants, architect, demolisher, contractor and representatives from the municipality were present at an initial planning meeting and later on at a physical inspection on site. At the physical inspection everybody was asked to keep an open mind and listen to others' experience and ideas. This kind of process demands very clear communication from the building client, in this case the municipality, in order to make clear the purpose and frame for the work so the others know how to act in the process. “Basically it is a creative process and it was evident that the architect was familiar with the idea, but the environmental consultant on the other hand needed a bit more time and words before they were comfortable with the process” (Kellermann and Buchard, 2023). The authors mention that trust is key to understanding the procedure: elements like responsibility and risk are kept open until later in the process. “Everybody was encouraged to flag any elements of risk they were aware of at any time in the process. ...This again led to very fruitful discussions and creative .” (ibid, p15-16). “Early market dialogue gives both parties a chance of eliminating the worst misunderstandings and reaching a balance between need and capacity” (Kellermann and Buchard, 2023).

For the car park demonstration action an innovative approach was adopted to avoid heavy costs for contractors to cover the risks included in terms of soil pollution and obtaining a municipal permit according to art. 8 in the Soil Pollution Act. Therefor, as commissioner the municipal building department arranged the permit herself before engaging in the tendering. This saved costs that the contractors would have to include in their bid. This practice has later led to a new procurement strategy in the building department where three elements are always contemplated in advance of deciding where a risk shall be placed in a building process, namely: risk, responsibility and consequences. This is referred as the “Circular procurement strategy”.

“In this project, the builder undertook detailed investigations of the site in advance so the risks were uncovered and the information was available in the tender” (p41).

External expertise from advisors was hired by the building department for e.g. the adoption of the End of Waste criteria and tendering procedure.

As comes to cooperation with citizens, the officer has good experiences with citizens involvement in the demonstrations, as users or as workers: “everybody wants to be part of it, wants to listen if they can be in on it”. The users are always very interested in the works of the department. Some of them are complaining about the aesthetics of the sustainable buildings, but when explained by the municipal office how things are, they become very enthusiastic. So it is only a positive experience.

Citizens: In the car park demonstration action neighbours were informed about the crushing of concrete found under ground, in advance during an information meeting held by the contractor on site. The meeting was part of the contractors obligations to communicate activities to local actors in Musicon in order to prevent unnecessary conflicts due to lack of knowledge of the ongoing activities. In other projects it has shown fruitful to communicate activities which could give rise to worries, very directly and openly“ (Kellermann and Buchard, 2023 p43). The duration of the nuisance was kept short.

### 3. Resources

Finances: In the City Council’s 2022 budget agreement circular building is among the main foci also budget wise. 5-10% of construction in the budget agreement is associated with circular construction. As knowledge and info tools are concerned: For the CDW demonstrations pre-demolition audits were performed and material passports documented. A virtual material bank was developed using Building Information Modelling (BIM) for information on regulations, quantities, material types. Also a Life cycle assessment (LCA) on selected materials was done. The car park required a physical material bank. And an instrument for predicting future excavated soil production was developed. “Barriers to soil reuse have shown to be lack of initial investigations regarding pollution and geotechnical soil parameters. Cooperation between the consulting engineer and the authorities have proved to be essential for optimising soil reuse and at the same time secure people and the environment. Retention of knowledge and ongoing focus on the goal for circular soil reuse has shown to be improved by keeping the same consulting engineer and keeping an ongoing inclusion of the environmental authorities and the developer”(Kellermann and Buchard, 2023 p66). “... there are plans to expand the material bank into a virtual platform that covers the entire district... By identifying buildings that may become obsolete in the next 5-10 years, the municipality can anticipate the release of materials such as concrete, which can be broken down and reused”(Kellermann and Buchard, 2023 p73).

### 4. Formal and informal rules and regulations

Political willingness: the city council has given high importance to CE and sustainable building in specific this year, reflected in the budgetary agreement.

As working practice within the offices, it “is crucial to conduct a meticulous evaluation that weighs the environmental benefits against the associated costs at every step of the waste hierarchy. By making informed decisions regarding the recycling and reuse of building



materials, municipalities can strike a balance between sustainability and economic considerations” (Kellermann and Buchard, 2023). In terms of Construction and Demolition waste the culture within the city procurement offices is very innovative. Officers are pushing each other as much as they can. There is an internal and positive competition, creating innovative ideas, while pushing the boundaries every time. They have different personal touches between the projects, while cooperating with each other. ‘There’s a lot of coffee talks’. That some other departments are (not yet) that innovative but more conservative, doesn’t harm them. Roskilde wants to roll out the circularity principles also in these other, more conservative departments.

As concerns the willingness of companies, according to the quick scan the market accepts the new order and need for circular innovation. ‘They know we have to do it’, says the respondent.

In terms of decision making, the respondent mentions the role of officers. These try to sense what the ideas of the politicians are and how to best proactively engage and with enthusiasm formulate proposals that fit well with the ideas of the politicians. This way the heads of department are approached from two sides: by politicians and by officers, and function as a hatch in two directions. Already in the idea phase connections via the head of department are made, as well as in the budget phase. In line with this, the decision making character is somewhere between top down and political, and based on facts and figures.

The Roskilde representations found during the quick scan that – in general - it are cultural issues that hinder progress towards CE. More concrete the preference for usual solutions and lack of willingness to take risks are mentioned. We have understood these as internal office culture and company culture, even though we have also heard positive stories about willingness to make progress in CE by sustainable building and circular material management.

When it comes to legislation, in Section 6 of the Waste Framework Directive (Directive 2008/98/EC of the European Parliament and of the Council), a series of conditions are listed that must be met for waste that has undergone a recycling operation or another recovery operation to be considered as ceasing to be waste. These are referred to as the ‘End of Waste’ criteria, which are that: the substance or object is commonly used for specific purposes; a market or demand exists for such a substance or object; the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and the use of the substance or object will not lead to overall adverse environmental or human health impacts (Kellermann and Buchard, 2023). Danish legislation now contains these ‘end of waste criteria’ (under Art. 28), and this “comes in incredibly handy” the respondent says. In the beginning of the change of the material to circularity, this ‘end of waste’ paradigm provides room to act.

All other legislation are a pain: typically the permit for clause 8 about soil, the respondent says. It is a possibility, but a huge work every time the office has to obtain it, though important to do. The officer tries to approach the matters in a positive manner. “If there’s a rule, try to use it to your advantage”.

Roskilde has developed a Step-by-step procedure for all circular demolition of municipal buildings (see the included tools under Resources). For the carpark construction Roskilde’s

building department had decided to carry out the tender as a turnkey contract. “According to The Public Procurement Act No. 1564 of 15 December 2015, the contracting authority can set the price or costs to ensure that competition is carried out based on qualitative criteria only. This gives the contracting authority an advantage in communicating the wishes for the building more effectively, compared to competition where price is the main focus. Underlining the focus on quality, it was decided to carry out the tender as a competitive procedure with negotiation according to The Public Procurement Act Section 61 -66. This means that the contractors will be participating in bilateral negotiations with the building authority after handing in a preliminary offer” (Kellermann and Buchard 2023, p37).

### **3.7.2. Progress Roskilde towards circular city**

Roskilde estimated to be at the level of progress 5. Indirect emissions (scope 3) are presently only calculated systematically in the building department. In other areas only direct emission levels 1 and 2 are calculated. The procurement department is behind in performance. A motivated and calculated 7-8 was given for specifically the municipality’s own building activities, based on the calculated scope 3 level (i.e. including all building related emissions). The University of Roskilde is supporting these estimates with research and calculations. The demonstration report provides more details. “The results are already visible and have created awareness in both our own organisation and in the local market” (Kellermann and Buchard 2023 p75).

### **3.7.3. Economic context Roskilde**

Roskilde Municipality is one of the largest business municipalities in Region Zealand. It is the municipality in Region Zealand with by far the most jobs, the greatest tourism potential and the largest range of different educational offers. 2020 has been strongly marked by the Corona crisis, which has affected the entire society and the whole world. Even then, there was still a clear trend that some companies/industries have performed even very well. This also applies in Roskilde Municipality.

Roskilde is characterised by a steady increase in population, namely by 2.67% from 2017-2021. The population in Roskilde is largely represented by higher education - more than twice as much as in the rest of the Region Zealand. Roskilde University attracts a number of new citizens every year and a portion of those stay in the municipality when they start working. This is balanced by a growing portion of elders in the population, since the number of deaths are decreasing (Kellermann and Buchard, 2023).



### **3.7.4. Physical context and spatial planning Roskilde**

Roskilde municipality is located in the eastern part of Region Zealand, covering an area of 212 km<sup>2</sup>. It is the most inhabited municipality in the region with 89,001 inhabitants in 2021. Land use is mixed in Roskilde: Agriculture, nature and low rise dwelling areas (Kellermann and Buchard, 2023). The physical characteristics of the city also definitely relate to becoming a circular city in general, the respondent says. Biggest obstacle is the accessibility to materials. The city needs a material bank that is bigger. That is why they go to other municipalities to have a bigger area to collect from. Space wise Roskilde doesn't have a problem. The officer has to make some effort to have the space for the material bank but is getting there.

ROSKILDE								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>133</sup>	Concrete elaboration <sup>134</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>135</sup>			
	++ <sup>136</sup>	+	+	+	-			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	++ <sup>137</sup>	-	++ <sup>138</sup>	++ <sup>139</sup>	++ <sup>140</sup>			
Resources	Capacity municipal officers towards CE	Use of automated data generation CE	Other tools <sup>141</sup>	Financial resources	Storage facility			
	++ <sup>142</sup>	++ <sup>143</sup>	++ <sup>144</sup>	++	-++ <sup>145</sup>			
Formal and informal rules	Political willingness (council, exec. Board)	Willingness in city offices	Use public procurement to promote CE <sup>146</sup>	Local regulations <sup>147</sup>	Nat. legislation	Ways of decision making	Awareness companies	Awareness citizens <sup>148</sup>
	++	++ <sup>149</sup>	++ <sup>150</sup>	- <sup>151</sup>	++ <sup>152</sup>	between top-down + political, facts & fig. based	++ <sup>153</sup>	++ <sup>154</sup>
Economic context	Economic situation: Strong economy and growth, rich population							
Physical context	Old concrete factory area is being reused/reconstructed for making a music hall, skateboard hall and parking.							
HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS? AND WHAT COULD BE DONE TO FURTHER PROGRESS								
In general	Policy discourse on Circular Material Economy being used. Good basis for CE actions by inter offices cooperation like Sustainability Group, communicative approach leading to broader awareness and involvement municipal offices and societal parties as well. Institutionalisation in procurement and national legislation that supports demonstrations and other CE actions. For CDW: knowledge based approach involving experts and LCA and calculations of performance in terms of CE. This supports the fact & figures based decision making.							
Demolition Hall 11/12 area, pre-serving build-	Procurement rules, pre-audit communication and knowledge retention approach contribute to expertise in circular material handling and good progress in CDW management of – for now still – mainly municipal property. Material market available for circular management as well. Growing awareness among involved companies.							

<sup>133</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>134</sup> Of CE policy or carbon neutrality policy

<sup>135</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics, putting CE to the background. No colour given, can be used different ways.

<sup>136</sup> At the time of interview the ratification process of the new 'Sustainable building strategy' was running, including CE and CO2 objectives. It relates only to the city's property and not to CE in general within the city proper, but the approach involving companies can nudge companies to circular material practices..

<sup>137</sup> focuses internal procedures in relation to the external processes, to help external partners understanding formal procedures; and improved internal handling of requests

<sup>138</sup> Informing and engaging them and avoiding nuisance

<sup>139</sup> E.g. early market dialogue, enhancing internal procedures, taking away risks for companies, continuing inclusion of partners for knowledge retention

<sup>140</sup> Continuing inclusion for knowledge retention. Calculations Roskilde university used for monitoring progress in terms of circularity

<sup>141</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>142</sup> Resourceful approaches and internal positive stimulation of innovation, and discursive practices using appealing concepts (e.g. Circular Material Economy)

<sup>143</sup> Virtual material bank using BIM, plan to expand it in order to cover the entire district

<sup>144</sup> E.g. pre-demolition audits, material passport CDW, LCA, soil management tool, step by step procedure for demolitions, monitoring for circularity calculations

<sup>145</sup> some effort needed to have the space for the material bank

<sup>146</sup> Referring structural use only, so not if only in the demonstrations

<sup>147</sup> Does the city or region make use of local regulations to support CE??

<sup>148</sup> Different from willingness which means going into action as well!

<sup>149</sup> Positive stories but also risk avoidance and preference for usual approaches

<sup>150</sup> Circular procurement strategy Roskilde city

<sup>151</sup> The city is following national legislation which is enabling circular building. Does not use own regulations to support CE.

<sup>152</sup> End of waste criteria 'comes in incredibly handy', and Danish public procurement act focusing quality above price. But also legislation that is implying a lot of work, e.g. concerning soil management, is being mentioned.

<sup>153</sup> Positive stories but also risk avoidance and preference for usual approaches. And at the end only some Danish contractors and concrete suppliers are also capable to handle crushed concrete and/or elements as reused material in new constructions.

<sup>154</sup> The willingness to contribute is there, in workshops, in labour. E.g. the Orangemakers experience. "So there's a sense of community, absolutely."

dings, facilitating reuse CDW	
Construction parking houses	Material market enables reuse of material from nearby in Roskilde. Communicative approach supports awareness among parking users and provides officers with relevant information to adapt the parking to local needs (info study visit).
Circular soil management	Results of circular soil strategy are being incorporated in urban development strategies and in real estate management strategies. This may contribute to impact beyond processes around municipal properties only. Cooperation between the consulting engineer and the authorities were essential for optimising soil reuse and at the same time secure people and the environment. Cooperative attitude municipality (permit, initial investigations pollution) and ongoing focus on goal for circular soil reuse helped a lot (Kellermann and Buchard 2023).

Table 5- Context, circularity demonstration actions and suggestions for Roskilde

## 3.8. Sevilla



Figure 18 - Metropol Parasol Sevilla, 2011, to invigorate the old town district and its plaza de la Encarnacion

### 3.8.1. Political and policy context Seville

#### 1. Policy content

In 2017 Seville initiated the Seville CE declaration which were finally signed by more than 200 municipalities in Spain (Cruces et al. 2023 p10). Sevilla has a strategic vision to become circular. So the city council supports it. Seville has a main ambition in terms of climate as well and wants to be a carbon neutral city in 2030. Sevilla is very much focused on becoming a circular city. In line with their strategic pillar 'sustainable city'. A CE vision is conditional to the aim of a carbon neutral city, and concerns the complete economy, not just waste. A CE is important to Sevilla in terms of mobility, energy, water, waste and food.

More in general the city council aims for a city that is open to all citizens in all ways. They want to become an inclusive city for citizens and employers and also a sustainable city. A city that is shared by all the citizens. Their strategic plan has six pillars: 1) employment promotion

and economic development; 2) reduction of poverty and inequality; 3) creating a sustainable city which mitigates and adapts to climate change; 4) develop the governance and participation of citizens; 5) promote civil rights, community life and civil values; and 6) promote culture, creativity and diversity in the city.

Seville is focused on advancing in accomplishing the targets established by the European Directive 2018/851 (recycling 55% of municipal waste by 2025, in addition to implementing bio-waste separate collection before 2024) and the Waste National Law 2022/7 which embedded these targets, and even it is more ambitious in some of them (Cruces et al. 2023).

"Two BioWaste demonstration actions were carried out in Seville. Demonstration action 1 was focused in the implementation of a bio-waste selective route in an area of Seville with improvements in their associated elements (containers, communication campaigns, etc.) and Demonstration 2 consisted in the evaluation of the bio-waste collected as a potential feedstock for anaerobic digester and biogas production." (Cruces et al., July 2023) The demonstrations were elaborated in mostly relative targets. For demo 1 these were: more circular containers for collection, greater amount of bio-waste collected with implementation of communication campaigns, greater purity of Bio-waste by technologies, an IT tool for improving the city's Bio-waste management, and minimize food waste. Demo 2 targets were to evaluate the bio-methanization potential of the bio-waste collected and the possible methods and strategies for managing bio-waste in digesters (Cruces et al., 2023). The general lines of action in the BW demonstrations are supported by relevant local strategies such as the Local waste prevention and management plan (currently in draft status) and the management program of LIPASAM.

And Seville runs three demonstrations on CDW: Renovation of water pipelines with circular material management; optimising clean points; Data driven decision making and Best Practice Guidelines for CDW Management.



Figure 19 - Communication campaign in school about the separate waste collection system, Sevilla (photo: Limpieza Pública y Protección Ambiental S.A.M (LIPASAM))



## 2. Cooperations/involved parties

As concerns the internal cooperation within Seville's offices, during the quick scan in 2021 the officers wrote that they are stimulated to cooperate with other city departments. They find that co-ordination is very important in projects or actions that involve the participation of various entities. Weekly follow-up meetings have been held for both demonstration actions to bring the various entities together.

Participation of citizens is one of the six pillars in the strategic plan of Sevilla. The city aims for an integral vision, and also connecting between industrial companies, for example use the waste of one company as an input for the other. Several institutions exist for the involvement of companies and citizens, e.g. the Board including companies and citizens that needs to be involved when sustainability issues are concerned. If a project is about sustainability, the city's agency of sustainability has a board with different parties including the citizens and companies to approve. The project needs the approval of this board before submitting it to the city council or the plenary for approval. Some decisions are very social and in consultation with citizens. E.g. if they want to do a participative budget in a district to choose between the design of one garden or another garden, they might do a consultation with residents and companies. The separation of organic waste goes in consultation with residents, in order to choose which method is best for them. For example the choice to open the container with a card, or have a bag in the houses and collect them. But the officer finds it a challenge to put CE in the minds of the population. In terms of sustainable handling of water the citizens are however very much aware of how to handle water sparsely.

The demonstration about optimizing the collection of waste from households and small business at clean points included an awareness campaign to prevent illegal dumping of CDW in vacant lots. The strategy in Sevilla within this demonstration action includes making it easier for citizens to discard of their CDW waste properly: the development of an online tool with which citizens can check where the clean points are and what the most suitable is for their waste.

The City Council of Seville is responsible for the public street cleaning services, waste collection and treatment, carried out by LIPASAM, which is a 100% public owned company. The waste treatment process is carried out in collaboration with a consortium that comprises the City of Seville and surrounding municipalities for the treatment of municipal solid waste (Cruces et al. 2023). City Council of Seville, LIPASAM, IDENER and EMASESA were responsible for the implementation of the demonstration actions in Seville. Other main stakeholders are ABORGASE (operator of the waste treatment plant), citizens and commercial establishments (ibid). LIPASAM, EMASESA, Seville City Council and ABORGASE were involved in the preliminary diagnosis for BW demonstration 1. Also conversations with City Council members and socioeconomic agent were held for it.

Based on identification of critical phases in the live chain of BW – production, manufacturing, retail, consumption and waste management – stakeholders were identified. These were contacted by phone and invited to life meetings for their input into the diagnosis. A snowball approach led to additional stakeholders. The Confederation of Commerce, Services and Autonomous of Seville, representing part of the commercial fabric was involved. They generate BW and may be affected by new local policies, regarding waste segregation, fees,



etc. Likewise, as waste generators, they are a fundamental part of obtaining quality waste at the source (Cruces et al. 2023). Park management were involved, various relevant technology and science institutions, as well as the Andalusian consumers union. (Cruces et al. 2023)

In two CDW demonstrations LIPASAM (Municipal Solid Waste Management Company) and EMASESA (Municipal Wastewater Treatment Management company) play a key role in the development of the demonstration action and the further application of the insights (first project) and the developed tools (second project). These public owned companies adopted circular criteria in their public procurement and were happy to see an increase in responses taking circularity into account.

### 3. Resources

From the quick scan in 2021 we learned that the financial situation in Sevilla is somewhat supportive to the process towards a CE. Currently there is no spending policy exclusively for Circular Economy initiatives in the Seville City Council and public organizations depend on it. These initiatives are embedded in budgets for other policies or entities.

There is no doubt about the opportunity to take advantage of this principle within the budgets allocated in 2023 to synergistic policies, such as the environmental policy of the Seville City Council, which in the 2023 budget reflects a planned expenditure of €36M (6.97 % more than in 2022) and employment promotion policies, with a planned expenditure of €20 M (71.94% more than in 2022)<sup>155</sup>.

Likewise, during these last few years, and in 2023, several projects have been carried out at the city level in which the concept of circular economy has been piloted in their respective areas (building rehabilitation works, adaptation of public roads, etc.), some examples have been<sup>156</sup>: Cartuja-Qanat, 15 M€; Sustainable Urban Development Strategy (EDUSI), 15M€; Life Water Cool (4 M€); Life Citrus (3,5 M€); and CityLoops (1M€). (contr. Cruces Oct. 2023)

“LIPASAM, the waste management company of Seville, plans to analyse the composition of the CDW collected in Clean Points, in order to evaluate the potential uses of the material recovered and be able to take decisions with the aim of recuperating costs for the clean points management and CDW treatment (Gallardo Sóler et al. 2023). At the moment using CDW instead of new material doesn't pay off in Sevilla. The current situation of the business case in Seville is defined by a short value chain structure with a few agents focused on CDW valorisation. No more than 2-3 agents centralize most of the CDW valorisation flows. There is a virgin raw material market nearby that is very competitive with prices of the natural aggregates being less than half in comparison with the artificial aggregates (vaporized CDW). Thus, there is limited interest in the use of artificial aggregates (valorised CDW) by most constructors.

<sup>155</sup> Report Seville City Council Budget Prevision 2023 (2023) [https://www.sevilla.org/cess/publicaciones/ano-2023/dictamen\\_presupuestos\\_2023.pdf](https://www.sevilla.org/cess/publicaciones/ano-2023/dictamen_presupuestos_2023.pdf)

<sup>156</sup> Economic-Financial Report City Council of Sevilla 2023 (2023). Department of Finance and Budget Management of the City Council of Sevilla. <https://www.sevilla.org/ayuntamiento/unidad-organica/servicio-de-gestion-presupuestaria/presupuestos-municipales/presupuesto-2023/archivos/03-informe-economico-financiero-2023-report.pdf>

In terms of human resources various kinds of expertise have been involved in the BW demonstrations, considering the stakeholder list in the demonstration report: technical, social, scientific, practitioners experiences, business... And their knowledge and experiences have been solicited and included in the projects. Also a new staff member for waste collection has been added, and the monitoring of the lock task has been attributed to an existing employee (Cruces et al. 2023). From the quick scan we learn that there is a need to further develop the expertise in CE among office staff.

“In order to comply with the current European objectives in the field of the municipal waste management, the [city] of Seville is seeking to implement various tools and actions, to advance the deployment of separate collection systems for bio-waste in the city of Seville, its ulterior treatment and valorisation as well as the optimisation of its logistics, awareness of households and large generators. “ (Cruces et al., July 2023)

From Cruces et al. (2023) we also learn that In the short-medium term, the implementation of the separate collection of the biowaste fraction will mean an increase in operating costs for the cities. In the first months and years participation by citizens and commercial establishments is small. Theoretically, the greater the selective capture of bio-waste, the flow of mixed rest waste must decrease – and thus of costs incurred for the rest waste must decrease. At the same time, waste management optimization tools, such as those developed in the project by IDENER, are emerging, which are desirable to rationalize operating costs as much as possible.

#### 4. Formal and informal rules and regulations

The Sevilla representation found during the quick scan that cultural issues hinder progress towards CE.

Seville's council's willingness to engage in the CE is high, speaking among others from its 2017 successful launch of the Sevilla Circular City declaration with numerous other Spanish cities. The Council supports the mission to become a carbon neutral city in 2030. The more general ambition of the council is to become an inclusive city for citizens and employers and also for sustainability, according the respondent.

The report on CDW-demonstrations shows that changes within the municipal procurement towards CE are an important goal that has been achieved: “The main challenge in municipal procurement in Seville is to change the current practice in which the price is the main tendering criterion to add a circular criterion valorising the produced CDW. EMASESA, the municipal company on water and wastewater management, has gone from including the circular criterion in the 23.53% of the procurements (before CityLoops implementation) to 100% in the procurements currently (at the end of the implementation period).” For the BW demonstration the tender of containers included as an evaluable clause that they were manufactured with recyclable materials. “Policy decisions are needed to uniform procurement strategies and CDW circular management. In this way, the municipality and all municipal

companies could implement common goals on circular economy that maximise the impact of circular procurement as well as CDW circular management and strengthen the CDW recycling business concept “ (Gallardo Soler, 2023).

In terms of awareness of citizens and companies of the importance of CE, the big challenge is to put the circular economy in their minds. Absence of consciousness of the need for a circular economy as a whole is the bigger problem. The CE is considered the base of Sevilla’s development and to be intertwined in the whole process of development. It should be in the whole thinking. The circular economy should already be incorporated from the start, the respondent says. As an example of the change of mindset the officer refers to Sevilla area no longer exporting oranges that were grown near Sevilla to the Netherlands which they then received back as juice. “Now we ... are shipping juice.” As comes to waste, in Spain the green parties are opposed to the incineration of waste. Sevilla wanted to put in an incinerator, but people are afraid for the incinerator. It is a technical problem they may overcome and solve. So for Sevilla it is very difficult to make the last step of the waste treatment, the respondent says. Concerning water, the collective culture is very good. Since Sevilla is very vulnerable to climate change, it is very much necessary to manage the water supply very well. People do not spill water, they are very aware of this. The best use of the water is very important for Sevilla as part of the circular economy. The officer relates CE not only to the product itself, but also to the process, like reuse, and use of Artificial Intelligence in the process. For example when you are thinking about regeneration of a new area of the city, then you need to think in a way of CE in the first step of the development, not only with waste treatment.

As ways of decision making are concerned, in Sevilla when officers have a new project in general the first step is the approval by the city’s daily government. If the project takes more than 4 years the parties of the executive board<sup>157</sup> government might change in the mean time, so there it needs to go to the city council for political approval. It depends on the type of project if you need to have another approval before you can start. For example, if the project is about sustainability, the agency of sustainability with its board including citizens and companies needs to approve, before it gets approved by the city council. The second step is the financial step. If funds are required these may be moved from one place to another. If the project is only with employees of the city or with the university it is usually not a problem. But usually technical assistance is needed, or buys or hire of something. Then public tendering is required.

If the project is intervening with the citizens or the city – like in the case of a very social project – then the officers need to share ideas with the citizens of the governance system in the district area to possibly improve the project.

For the CityLoops project decision making in Seville went very easily for the officers because they had to deal with the public companies, with whom decision making goes easier than with the city council. Also, CityLoops is mostly a technical project, so there was no need to interfere with the citizens a lot. The first step they took was that we went to the board of the city council

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<sup>157</sup> We use ‘executive board’ or ‘daily government’ for the Mayor and Aldermen that execute council decisions with help of the municipal offices on a daily basis. Whereas the ‘city council’ is used for all, directly by the public elected local politicians. In Sevilla they call the latter ‘the plenary’. The Sevilla respondent refers to the City Hall to indicate the city offices and its politicians in the executive board / daily government together.

to approve the project. In parallel they had the approval of the funds, because they merged the European funds together with the local funds. Now the technical people are just carrying out the project.

A city makes a lot of different decisions. In Sevilla all four forms of decision making occur. Its character depends on the project and the decision. For example, for changing the lighting in the streets they don't do a consultation, and will take a knowledge-based decision or public management attitude. But for a participative budget in a district to choose between the design of one garden or another garden, they may have a consultation with residents and companies. For most of the CE projects it have been knowledge based decisions, sensitive to facts and figures. But for example, if you want to know how to improve the separation of organic waste in relation with citizens, that will be in consultation with residents to choose which method is best for them, e.g. the choice to open the container with a card, or have a bag in the houses and collect them. The first step to decide which is the better treatment is not in consultation with residents but mainly knowledge based and based on considerations of efficiency.

As concerns legislation, a general and big problem is the law about CE in Andalucía which is only about the treatment of waste and not about CE. They need to become more conscious. Waste treatment is (relatively) easy to do. The officer calls for more laws about the circular economy, throughout the chains ('from the first step to the last step: "If you use anything in your live or to do a service, we need a form on your process. How to improve CE in general? A company thinks its very good when it separates waste. But that is not about CE. For example, when you start an internet company to make mugs, you need to take into account which materials you will use to make them, how you will transport them, and how you will envelop them, how you will make this all circular. There isn't any law, any policy about this integrative vision of the CE", the respondent says. Also in the first step of a process like re-urbanization they want to already design a full frame to have a CE. The respondent expressed the need for more comprehensive legislation, considering whole chains, users, companies. It is also imperative to comply with the objectives in terms of recycling and landfill disposal established by the European Union (Cruces et al. 2023). There is a Municipal Ordinance of Public Cleaning and Municipal Waste Management, improving the construction and demolition waste management system, optimizing the treatment of waste and the circulation of recycled materials, applying a more affordable tariff system in line with current times, and even collaborating in the management, treatment and in the last case, the elimination of construction and demolition waste to improve quality of life of citizens ([www.fermovert.es](http://www.fermovert.es))

### 3.8.2. Progress Seville towards a circular city

In terms of progress towards becoming a circular city, Sevilla self-assesses a 5. They are very far from the figures of the European Union, reusability is very low, the respondent finds. This needs to improve.

### 3.8.3. Economic context Seville

Seville's economy is not immune to the international economic context. The last months of 2023 have been characterized by a slowdown in global economic activity at a time when the economy is still suffering from the Covid health crisis, high inflation and the geopolitical problem between Ukraine and Russia. It is expected that the local economy may be reduced in the short term. In this context, the Sevillian economy seems to continue in line with the Spanish and Andalusian economies. The three geographical areas registered a slowdown in the growth of production and employment, compared to 2022.

Regarding the economic forecasts for the Sevillian economy, estimates indicate a growth in the Gross Domestic Product (GDP) of 1.6% in 2023 and 1.3% in 2024 (a considerable drop compared to 4, 9% registered in 2022). In the same way, job creation will suffer a slowdown and will go from a growth of 6.8% registered in 2022 to 1.1% in 2023 and 0.4% in 2024.<sup>158</sup>

Much of the Seville economy is based on Tourism and the sectors that largely depend on it, which have been greatly affected by the Covid health crisis, despite aid to companies and other socio-economic aid provided. The business fabric of Seville has decreased its weight, compared to the rest of Andalusia in recent years.

In this context, Seville understands that the CE is a fundamental tool for changing trends. In addition to the fact that it is essential to continue betting on Tourism, in a more sustainable model, it is essential to aim for the necessary diversity and economic resilience that allows maintaining employment and the city's economy, incorporating CE principles, models and projects in the traditional industrial sectors of the city, such as the aeronautical sector, as well as other emerging sectors such as biomedicine, health sector, renewable energy, the chemical sector, engineering and ICT, agribusiness, etc.<sup>159</sup>

### 3.8.4. Physical context and spatial planning Seville

'Seville is the fourth most populous city in Spain (684.234 inhabitants in 2021) and it is the capital and the most populous city of the region of Andalusia, in the south of Spain. It is a large monocentric city and part of a polycentric agglomeration, the metropolitan area of Seville. The extension of the city is 141,42 km<sup>2</sup> and has a density of 4.818 of Inhabitants per km<sup>2</sup>. The main economic sectors of the city are commerce, food and restaurants, mainly due to tourism. Additionally, the agriculture sector has a significant importance when considering the broader metropolitan area of Seville' (Cruces et al. 2023). Sevilla is very vulnerable to climate change, because of its location in the south of Europe they have a problem with water, both droughts and floods. Therefore carbon neutrality is important in all fields.

The fact that the water pipeline infrastructure needed a renovation was supportive to the circular CDW demonstration action and its outcomes.

<sup>158</sup> Seville Economic Barometer. Economic Situation Third Quarter 2023 (2023). College of Economists of Seville. <https://economistas-sevilla.com/wp-content/uploads/2023/10/BAROMETRO-ECONOMICO-SEVILLA-OCTUBRE-2023.pdf>

<sup>159</sup> Socio-economic Report of the City of Seville (2021). Economical and Social Council of Seville (CESS). <https://www.sevilla.org/cess/publicaciones/ano-2022/dictamen-sobre-el-informe-socioeconomico-de-la-ciudad-de-sevilla-2021.pdf>



SEVILLE								
Policy content	Main policy discourse on CE	Main policy discourse on carbon neutrality <sup>160</sup>	Concrete elaboration <sup>161</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>162</sup>			
	163++	++	+164	++165	+			
Cooperations and parties involved in decisions	Internal within municipal offices	With politicians	With citizens	With companies	With experts			
	++	++166	++	++167	++168			
Resources	Capacity municipal officers towards CE <sup>169</sup>	Use of automated data generation CE	Other tools <sup>170</sup>	Financial resources	Storage facility			
	+171	+172	+173	+174	+175			
Formal and informal rules	Political willingness (council, exec. Board)	Willingness in city offices <sup>176</sup>	Use public procurement to promote CE <sup>177</sup>	Local legislation <sup>178</sup>	Nat. legislation <sup>179</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>180</sup>
	++181	_182	-+183	+184	++185	All 4 types	-+186	-+187
Economic context	The city is the Andalusian capital and the most important inland port of Spain. It is the centre of a growing metropolitan area and good for a quarter of the Andalusian GDP. Financial resources for making the transition towards CE are however a challenge (quick scan).							
Physical context	684.234 inhabitants in 2021 (Cruces et al. 2023) Need for reconstruction of waterpipes was the reason for the demonstration on their circular renovation. The city has very densely build parts, especially in the historic centre.							
HOW DOES CONTEXT INFLUENCE DEMONSTRATION ACTIONS? AND WHAT COULD BE DONE TO FURTHER PROGRESS								
<p><b>In general:</b> There's political interest in CE and support. Communication wise, a well developed situation and good cooperation. Also awareness of the need for and meaning of CE beyond waste management at the official level has increased, as shown e.g. by the recent new Andalusian legislation. Awareness is an issue with companies and citizens. There are now competitive calls from the Andalusian government for aid to encourage companies and local authorities to make technologies more circular. These are about energy, waste and water sectors mainly.</p> <p>A board for obligatory consultation with companies and citizens exists that need to consent with social dimensions of projects before their submission to the council. In terms of automated data there is work ongoing. LIPASAM is strongly developing its digitalization strategy. And also for the city offices. It is expected that the use of these IT tools will increase in the future. Institutionalization of circular procurement has not yet been arranged.</p>								
<p><b>Demo: Renovation waterpipes with circular material management</b></p> <p>The city is densely build for an important part. It is not obvious that for CDW and stripping of buildings - which was not a demo in Sevilla, but nevertheless an important activity as part of CE - storage capacity within the city area nearby work sites is available, in order to reduce transport and emissions. Tools such as the soil balance sheets or circularity calculations like from e.g. Roskilde may be interesting for Sevilla as well.</p>								
<p><b>Demo: Optimising clean points</b></p> <p>Data management can be used to enhance fact and figures based decision making and create awareness and co-ownership among citizens of CDW management and CE.</p>								
<p><b>Demo: Best Practice guidelines CDW management</b></p> <p>This is a tool that can support the progress towards CE in terms of CDW management.</p>								
<p><b>Demo: Implementing BW collection route in neighbourhood</b></p> <p>Demonstration and included awareness raising has been successful. Upscaling beyond the local scale is an important challenge in terms of scope. The broader implications of CE, beyond waste management could maybe be included as a subject for the awareness raising in new city districts. This can be picked up by the public companies, but among politicians discursive practices promoting the understanding of the meaning and importance of CE could also be of help to mobilize societal parties. Consumer organization and members of the board for citizens and companies involvement can maybe be consulted about taking a role. Possibly the commercial establishments that have cooperated can be mobilized to help sensitize establishments elsewhere in the city. IT data management needs further attention (Cruces et al. 2023). Use of data tool to be institutionalized in support of fact and figures based decision making.</p>								
<p><b>Demo: biomethane production in co-digestion with sludge</b></p> <p>This is mostly a technical demonstration. Is it ecologically a good idea to co-digest BW instead of using all organic material for compost as source of soil organic matter in and around the city in the more rural and farming areas? True pricing of artificial fertilizer could be looked into to see if it could enhance the commercialisation of the compost. It would have to become part of the local, national and even EU rules and regulations.</p>								

Table 6- Context, circularity demonstration actions and suggestions for Sevilla

<sup>160</sup> CE development is only partly overlapping with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. Accordingly energy transition policies concern only part of CE development.

<sup>161</sup> Of CE policy or carbon neutrality policy

<sup>162</sup> Positive score means that there are other policies than CE and carbon neutrality that dominate politics, putting CE to the background

<sup>163</sup> It is not one of the 6 main pillars of Sevilla policy, but there is a separate strategy on CE that has been approved by the City Council. And the 2017 Seville CE Declaration was initiated by the city.

<sup>164</sup> Local waste prevention and management plan (currently in draft status), management program of LIPASAM, targets, targets European Directive 2018/851, separate BW collection before 2024, mostly relative targets (more... greater....).

<sup>165</sup> Involvement various entities "very important", weekly meetings with those entities, institutions for involvement citizens and companies ( the Board)

These above results for the seven cities mostly focus BW and CDW management. This does not include all materials and therefore we need to keep some reservations concerning the progress assessments made. Also the means of influence used are maybe not complete and the marks given may have missed out on certain sectors, although they have been checked by the city respondents or officers. For BW and CDW the insights gained are however quite well documented.

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<sup>166</sup> The feeling that officers have is that it is easy to have contact with politicians from the executive board and the council and work with them. Internal decision making with the public companies goes easier than with the council.

<sup>167</sup> There are Institutions for their involvement e.g. a board, and also shown in the demonstrations actions that these are being used

<sup>168</sup> technical, social, scientific, practitioners experiences, business... And their knowledge and experiences have been solicited and included in the projects.

<sup>169</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>170</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>171</sup> Use of multiple expertise, but need to further develop staff expertise in CE.

<sup>172</sup> Data collection on CDW composition Clean points and for monitoring use in sub-base of constructions. Internet data with interface for waste managers and citizens to monitor and manage the BW flow. Digitalization strategy LIPASAM being executed now. 2022 Digitilization strategy City council expected to succeed. Actual exploitation of data still low but expected to increase in the future (contr. Cruces).

<sup>173</sup> best practice guidelines for CDW

<sup>174</sup> According to results quick scan. Recently Andalusian calls to encourage local authorities (and companies) to make technologies circular..

<sup>175</sup> Storage capacity structurally available for next 5 to 10 years for both CDW and BW, close but beyond the city borders, mainly in terms of landfill. This is and will be stopped by the landfill tax that is being implemented nation wise. The cost will be multiplied by a price times 2,5. Rather the technological capacity of the plant for treatment is a barrier to circularity.

<sup>176</sup> Existing in awareness of meaning and importance of CE and taking action towards a CE

<sup>177</sup> Referring structural use only. Only used in the demonstrations.

<sup>178</sup> Does the city or region make use of local regulations to support CE?

<sup>179</sup> National legislation is supportive, following EU guidelines/directives. End of waste criteria not referred.

<sup>180</sup> Different from willingness which means going into action as well!

<sup>181</sup> Seville CE declarations initiated from Seville demonstrates political interest, council is committed to CE (also see results quick scan in Annex)

<sup>182</sup> Cultural issues hinder progress.

<sup>183</sup> For CDW by EMASESA only. Procurement practices need to change.

<sup>184</sup> Andalusian legislation has recently been improved and is including CE besides waste management. The city makes no use of possibility to formulate local rules and regulations for CE.

<sup>185</sup> Advanced national legislation in terms CE is very supportive, according quick scan. Much higher taxation on landfill is being implemented.

<sup>186</sup> Cultural issues are hindering

<sup>187</sup> "a challenge to put CE in the minds of the population", awareness campaign to prevent illegal dumping of CDW in vacant lots and ditches.

## 4. Comparison between the cities

### 4.1. Introduction

In this part of the analysis we compare the seven cities on political and policy context to the demonstration actions. Nota bene that the demonstration actions are part of this – what we described in the theoretical section as -system as well, with their means of action.

In this chapter we present the results from the tables in chapter 3, now organized per category of means of influence. First comes the table with policy content for all seven cities, then with cooperations, resources, and rules and regulations, each for all cities combined, so you can see the differences between the cities (4.2). It is interesting to see how the cities differ in the means of action employed and in terms of the more institutionalized setting. After the tables we describe this in the sections 4.3– 4.5, with the observations on commonalities and differences. Then in 3.2.7 and 3.2.8 we compare the physical and economic setting to the demonstration actions. In 3.3 we describe what we can learn from all this.

## 4.2. Comparison tables per means of influence

The tables present the general setting in the cities - the systemic factors - as well as actions. N.B. not included are the physical and economic context.

Table 7- Policy content << Meaning of marks: - absent; -+ weak presence; + present; ++ strong >>

	Main policy discourse on CE <sup>188</sup>	Main policy discourse on carbon neutrality <sup>189</sup>	Concrete elaboration <sup>190</sup> CE policy in targets and program	Roles multiple parties defined in CE policies	Competing other policies <sup>191</sup>
Apeldoorn	.. <sup>192</sup>	+ <sup>193</sup>	+ <sup>194</sup>	..+ <sup>195</sup>	++
Bodø	+ <sup>196</sup>	+	+	+ <sup>197</sup>	++
Høje-Taastrup	-	+	+	++	-
Mikkeli	..+ <sup>198</sup>	+	+ <sup>199</sup>	+ <sup>200</sup>	++
Porto	++ <sup>201</sup>	++	..+ <sup>202</sup>	+ <sup>203</sup>	+
Roskilde	+ <sup>204</sup>	+	+	+	-
Sevilla	++ <sup>205</sup>	++	+ <sup>206</sup>	++ <sup>207</sup>	+

<sup>188</sup> If only for one type of waste a policy exists, we give no more than one +.

<sup>189</sup> CE development only partly overlaps with climate change mitigation or CO2 neutrality management, and comprises many dimensions of managing the use of materials in addition. So energy transition concerns only part of CE development.

<sup>190</sup> Of CE policy or carbon neutrality policy

<sup>191</sup> Positive score means that there are other policies than CE or carbon neutrality that dominate politics, putting CE to the background. Not coloured, because they can be used for piggyback riding as well, i.e. turned into something positive for CE.

<sup>192</sup> Koersdocument 2030 mentions 'circular' 22 times but is a big container document.

<sup>193</sup> Energy transition 2023-2030 policy mentions circularity a few times. Koersdocument 2030 names energy neutrality for 2050 (p.43).

<sup>194</sup> 25 % reduction raw material use (no time horizon), 30 kg/year/person residual waste in 2025 (before 2030 in 'Woest aantrekkelijk', 'afvalbeleidsplan', more woodconstruction 2040, 2023 25% procurement (in euros) is circular ('Woest aantrekkelijk', only refers national targets: in 2030 use abiotic minerals, metals and fossile resources halved. 2021 waste selection 75%, no more complete disapproval of resources).

<sup>195</sup> Companies mentioned in the Koersdocument, but their roles are not defined, Action week Zero Waste Apeldoorn addresses citizen's awareness

<sup>196</sup> 4 yearly Climate and Environment Plan on how to reach 70% reduction CO2 emission

<sup>197</sup> Score is based on the fact that there is an active involvement and facilitation by Bodø of companies and their activities

<sup>198</sup> the political parties have stated in a workshop in Sep 2021 that CE development is important (info Haapea sep 23)

<sup>199</sup> In 2022 new climate program came with clear goals, actions and indicators for the bio-economy. CDW policy is more new but now projects are under development and city takes CDW in account now.

<sup>200</sup> The development in 2023 has been positive, and Mikkeli has even started the circular economy days -action, that includes many participants

<sup>201</sup> 'Roadmap to a circular city, elaborates time horizon, actions, roles of parties, ...

<sup>202</sup> Roadmap sets a transition vision up to 2030. Quantitative and ambitious targets have not been formally updated since 2017 and are not detailed beyond 2020.

<sup>203</sup> Roadmap sets roles of parties with its governance section and counted with stakeholders contributions to define CE vision and strategy. Good involvement different types of stakeholders in the demos.

<sup>204</sup> At the time of writing the ratification process of the new 'Sustainable building strategy' was running, including CE and CO2 objectives. It relates only to the city's property and not to CE in general within the city proper, but the collaborative attitude of the city can nudge companies to circular material practices.

<sup>205</sup> not one of the 6 main pillars of Sevilla policy, but there is a separate, council approved CE strategy. And the 2017 Seville CE Declaration initiated by the city.

<sup>206</sup> Local waste prevention and management plan (draft status), management program LIPASAM, targets, targets European Directive 2018/851, separate BW collection before 2024, .. but mostly relative targets

<sup>207</sup> Involvement various entities "very important", weekly meetings with those entities, institutions for involvement citizens and companies, e.g. by the Board, ...

Table 8- Cooperations and parties involved in decision making and actions << Meaning of marks: - absent; -+ weak presence; + present; ++ strong >>

	Internal within municipal offices	With politicians	With citizens	With companies	With experts
Apeldoorn	-+ <sup>208</sup>	-+ <sup>209</sup>	-+ <sup>210</sup>	-+ <sup>211</sup>	+ <sup>212</sup>
Bodø	++ <sup>213</sup>	-+ <sup>214</sup>	-+ <sup>215</sup>	-+	+
Høje-Taastrup	+ <sup>216</sup>	+ <sup>217</sup>	-	++ <sup>218</sup>	-+ <sup>219</sup>
Mikkeli	+ <sup>220</sup>	+ <sup>221</sup>	++ <sup>222</sup>	++ <sup>223</sup>	+
Porto	++ <sup>224</sup>	+ <sup>225</sup>	+ <sup>226</sup>	++	++ <sup>227</sup>
Roskilde	++ <sup>228</sup>	-	++ <sup>229</sup>	++ <sup>230</sup>	++ <sup>231</sup>
Sevilla	++	++ <sup>232</sup>	++	++ <sup>233</sup>	++ <sup>234</sup>

<sup>208</sup> It is growing, e.g. climate, green management, communication officers are investing in this

<sup>209</sup> Rare, focuses reduction of waste

<sup>210</sup> Client server relation, some cooperation with small civic society organizations (CSOs) in the demos

<sup>211</sup> A building team was organized for consultation between municipal officers and builders about possibilities for circularity CDW. E.g. covenant BAM Infra. But in general relation with companies is rather a service relation.

<sup>212</sup> TNO, WUR, Saxion

<sup>213</sup> Easy to consult other offices, cross departmental working groups installed permanently

<sup>214</sup> Not current but can consult politicians

<sup>215</sup> 'to listen to citizens better', for citizens well accessible website

<sup>216</sup> Sustainability Group

<sup>217</sup> Confidence between offices and politicians

<sup>218</sup> Via active mayor and via circular building projects

<sup>219</sup> Only concrete-expert Pelcon mentioned

<sup>220</sup> Employees of City of Mikkeli and public waste company Metsasairila cooperated in demonstrations (info Haapea, 19 sep 2023).

<sup>221</sup> August workshop Miksei development company with politicians on decisionmaking (nof Haapea, 19 sep 2023)

<sup>222</sup> Including ambition to include CE in vocational curricula

<sup>223</sup> Entrusting development upon companies while short of public budget

<sup>224</sup> Officers are stimulated to cooperate with other departments

<sup>225</sup> E.g. vice mayor celebrating first compost produced', technical staff can contact politicians, via the hierarchical lines. Organisation is not very hierarchical.

<sup>226</sup> Well developed approaches to stakeholder involvement, but more user information than information by users. Center for Social Innovation enhances role citizens.

<sup>227</sup> E.g. with JRC, many different expertises have been involved in the demonstration actions

<sup>228</sup> focuses internal procedures in relation to the external processes, to help external partners understanding formal procedures; and improved internal handling of requests

<sup>229</sup> Informing and engaging them and avoiding nuisance

<sup>230</sup> E.g. early market dialogue, enhancing internal procedures, taking away risks for companies, continuing inclusion partners for knowledge retention

<sup>231</sup> Continuing inclusion for knowledge retention. Calculations Roskilde university used for monitoring progress in terms of circularity

<sup>232</sup> The feeling that officers have is that it is easy to have contact with politicians from the executive board and the council and work with them. Internal decision making with the public companies goes easier than with the council.

<sup>233</sup> There are Institutions for their involvement e.g. a board, and also shown in the demonstrations actions that these are being used

<sup>234</sup> technical, social, scientific, practitioners experiences, business... And their knowledge and experiences have been solicited and included in the projects.



Table 9- Resources

<< Meaning of marks: - absent; -+ weak presence; + present; ++ strong >>

	Capacity municipal officers towards CE <sup>235</sup>	Use of automated data	Other tools <sup>236</sup>	Financial resources	Storage facility
Apeldoorn	+	-+ <sup>237</sup>	-+ <sup>238</sup>	+ <sup>239</sup>	-+ <sup>240</sup>
Bodø	+	+ <sup>241</sup>	++	+	++ <sup>242</sup>
Høje-Taastrup	+		+	++	+
Mikkeli	+ <sup>243</sup>	-+ <sup>244</sup>	+ <sup>245</sup>	-+ <sup>246</sup>	+ <sup>247</sup>
Porto	++ <sup>248</sup>	+ <sup>249</sup>	+ <sup>250</sup>	-+ <sup>251</sup>	252-+
Roskilde	++ <sup>253</sup>	+ <sup>254</sup>	++ <sup>255</sup>	++	-+ <sup>256</sup>
Sevilla	+ <sup>257</sup>	+ <sup>258</sup>	+ <sup>259</sup>	+ <sup>260</sup>	+ <sup>261</sup>

<sup>235</sup> Proactive attitude (e.g. piggyback riding, showing business model), CE expertise, participation expertise within the offices.

<sup>236</sup> E.g. LCA, 3 D tools, soil balance tool etc. that support facts and figures based decision making

<sup>237</sup> GBI contains data on material storage but it is not used a lot, especially not in contract management

<sup>238</sup> Circulus as semi-public company manages the fact and figures of waste and its management and costs in Apeldoorn, LMA (National Registration Point Waste) is too much focused waste registration, and not prevention (A.H. 25 Sep. 23). Apeldoorn has access to this system, but it is not optimally used.

<sup>239</sup> Serious concerns for the futures (Dutch Association of Local Authorities speaks of a 'financial canyon')

<sup>240</sup> There are too few structural storage facilities, temporary along the highway now for CDW.

<sup>241</sup> use ongoing

<sup>242</sup> Included in policy

<sup>243</sup> 2023 the situation has improved (info Haapea 19 sept. 2023)

<sup>244</sup> For CDW a databank incl. demolition sites, material lots, and materials has been developed, using guidelines from the national Ministry of Environment. however, limited compatibility with other systems such as the marketplace. Need for a more advanced system. For pre-demolition audit software was developed using CityLoops guidance.

<sup>245</sup> CO2 calculator Roskilde has been tested for concrete, soil and mixed CDW by the semi-public Xamk and Miksei companies that are (co-) owned by Mikkeli

<sup>246</sup> Biogas progress is supported by Finnish subsidies

<sup>247</sup> Storage of materials is referred as a problem for the dental clinic demonstration. Also specific room for waste bins in apartment buildings is an issue. But considering the low density of Mikkeli buildings we presume it is not a major general challenge for the city when it comes to outside storage of masses.

<sup>248</sup> Try to make the most out of every resource / piggyback riding, open minded and city-lab pilar. Analytical attitude, see demonstration report.

<sup>249</sup> Working on it with e.g. JRC and combining towards measuring SDG impact. It is standard to use GIS and other data and monitor impact.

<sup>250</sup> Monitoring of impact. Currently, they produce their first local voluntary report on the Sustainable Development Goals. This is an example for a set of indicators for the whole municipality that they need to connect with databases from other departments. Porto has already a public Porto Open Data and is working on a unique and more complete internal Monitoring Data Base for technical and political support decisions.

<sup>251</sup> After decline during Covid, slight growth of city budget. After a project is finished there's no provided budget to continue some of the demonstration actions.

<sup>252</sup> Demonstration report refers the lesson learned that in urban planning space needs to be included for circular use BW collection and circular treatment

<sup>253</sup> Resourceful approaches and internal positive stimulation of innovation, and discursive practices using appealing concepts (e.g. Circular Material Economy)

<sup>254</sup> Virtual material bank using BIM

<sup>255</sup> E.g. pre-demolition audits, material passport CDW, LCA, soil management tool, step by step procedure for demolitions, monitoring for circularity calculations

<sup>256</sup> some effort needed to have the space for the material bank

<sup>257</sup> Use of multiple expertise, but need to further develop staff expertise in CE.

<sup>258</sup> Data collection on CDW composition Clean points and for monitoring use in sub-base of constructions. Internet data with interface for waste managers and citizens to monitor and manage the BW flow. Digitalization strategy LIPASAM being executed now. 2022 Digitilization strategy City council expected to succeed. Actual exploitation of data still low but expected to increase in the future (contr. Cruces).

<sup>259</sup> best practice guidelines for CDW

<sup>260</sup> According to results quick scan. Recently Andalusian calls to encourage local authorities (and companies) to make technologies circular..

<sup>261</sup> Storage capacity structurally available for next 5 to 10 years for both CDW and BW, close but beyond the city borders, mainly in terms of landfill. This is and will be stopped by the landfill tax that is being implemented nation wise. The cost will be multiplied by a price times 2,5. Rather the technological capacity of the plant for treatment is a barrier to circularity.

Table 10- Formal rules and regulations, and informal rules such as cultural values and practices

	Political willingness (council, Board)	Willingness in city offices	Use public procurement to promote CE <sup>262</sup>	Local legislation <sup>263</sup>	Nat. legislation <sup>264</sup>	Ways of decision making	Awareness companies	Awareness citizens <sup>265</sup>
Apeldoorn	– <sup>266, 267</sup>	– <sup>268</sup>	+ <sup>269</sup>	–	– <sup>270</sup>	hierarchical	–+	+
Bodø	+ <sup>271</sup>	–+	+ <sup>272</sup>	+ <sup>273</sup>	+ <sup>274</sup>	hierarchical	–+	+
Høje-Taastrup	+	+ <sup>275</sup>	+ <sup>276</sup>	++ <sup>277</sup>	+	all 4 types	+	+
Mikkeli	+ <sup>278</sup>	–+	+ <sup>279</sup>	– <sup>280</sup>	+ <sup>281</sup>	all 4 types	+	+ <sup>282</sup>
Porto	++ <sup>283</sup>	+ <sup>284</sup>	– <sup>285</sup>	286	++ <sup>287</sup>	all 4 types, most facts and figures based	+ <sup>288</sup>	–+

<sup>262</sup> Referring structural use only, so not if only in the demonstrations

<sup>263</sup> Is there specific local legislation that supports CE?

<sup>264</sup> Is there specific national legislation that supports or facilitates local CE policies or actions? E.g. end of waste crit.; strategy green CE, public role waste

<sup>265</sup> Different from willingness which means going into action as well! We consider awareness as a basis for willingness.

<sup>266</sup> Weak, but at present one alderman since the elections is pushing CE

<sup>267</sup> Also explained by limited national policy attention to CE if compared to the energy transition

<sup>268</sup> Possibly furthered by instalment and work of the moderator ('kwartiermaker')

<sup>269</sup> Recently the manifest for MVO (social responsibility in procurement) has been signed, includes CE

<sup>270</sup> In the process, still weak according to respondents

<sup>271</sup> Politicians are quite eager (cross consortium meeting 22 Sept 23 Kristenssen) Circular economy category in the environment plan for Hernes (new airport district). This document is not only guiding, but also politically committing on how CDW and city development is done in the huge demonstration action/area.

<sup>272</sup> 'routines'

<sup>273</sup> Operators to reuse material as much as possible

<sup>274</sup> End of waste criteria, strategy green CE, storage nearby for reuse

<sup>275</sup> Big part of the offices, since recently also a roadmap to municipal roles

<sup>276</sup> CDW and e.g. care workers uniforms, ..)

<sup>277</sup> Criteria in policies, parameters pre-purchase development agreement

<sup>278</sup> Situation has become more positive last year (Pers. Info Haapea Sep 2023)

<sup>279</sup> For various materials, including CDW and BW, 25% of procurement (in finance) should be circular in 2025; reversed tendering could be used in demolition contracts: price is fixed, and awarding based on the quality of circular solutions proposed by the contractors.

<sup>280</sup> According to the regulations of the city, bio-waste must be sorted separately from mixed waste also in private households. A hindering legislation is that CDW waste is to be delivered to the public company Metsasairila which implies that market parties such as "recycling operators" can not engage in stripping the building and marketing materials (Haapea 2023).

<sup>281</sup> Demolition permit obligatory, on submission estimate of the types of waste generated and plan for their management. usable objects and substances to be recovered and reused, organizing separate collection for eleven types of waste, Target 70% 2020.

<sup>282</sup> 80% Finish population in favour CE, but lack of knowledge and motivation hindered adequate separate bio-waste collection. Malk et al. advise creative and unconventional information campaigning.

<sup>283</sup> 'Not one CE initiative that hasn't been approved by the council'. But there are concerns about understanding the CE is more than 'waste management at the end of the lifecycle'.

<sup>284</sup> Social services less aware of importance CE; Concerns about understanding that CE is more than waste management at the end of the lifecycle.

<sup>285</sup> requisites have been defined to the develop and implementation of a Circular Procurement Strategy (Claro et al. 2023, p60)

<sup>286</sup> Not referred. But Porto follows national legislation which is enabling. Certification Greenspace is a form of local regulation of quality.

<sup>287</sup> All demonstrations are framed by enabling national policies. EU law on competition however is hindering when office wants to for example only buy locally or with sust. criteria. The Smart Collection System tool concerning household biowaste in smart collection bins, based on a mathematical model, was not developed due to data protection laws conditioning information sharing.

<sup>288</sup> Willingness to act is high, but at the same time reference to lack awareness of extended producer liability among companies (result quick scan). Sometimes wait for municipality to take action.

Roskilde	++	+ <sup>289</sup>	++ <sup>290</sup>	- <sup>291</sup>	++ <sup>292</sup>	between hierarchical and facts and figures based	+ <sup>293</sup>	++ <sup>294</sup>
Seville	++ <sup>295</sup>	- <sup>296</sup>	-+ <sup>297</sup>	+ <sup>298</sup>	++ <sup>299</sup>	all 4 types	-+ <sup>300</sup>	-+ <sup>301</sup>

<sup>289</sup> Positive stories but also risk avoidance and preference for usual approaches

<sup>290</sup> Circular procurement strategy Roskilde city

<sup>291</sup> Following national legislation which is enabling circular building. City seems to make no use of possibility to formulate local rules and regulations.

<sup>292</sup> End of waste criteria 'comes in incredibly handy', and Danish public procurement act focusing quality above price. But also legislation that is implying a lot of work, e.g. concerning soil management, is being mentioned.

<sup>293</sup> Positive stories but also risk avoidance and preference for usual approaches. And at the end only some Danish contractors and concrete suppliers are also capable to handle crushed concrete and/or elements as reused material in new constructions.

<sup>294</sup> The willingness to contribute is there, in workshops, in labour. E.g. the Orangemakers experience. "So there's a sense of community, absolutely."

<sup>295</sup> Seville CE declarations initiated from Seville demonstrates political interest, council is committed to CE (also see results quick scan in Annex)

<sup>296</sup> Cultural issues hinder progress.

<sup>297</sup> For CDW by EMASESA only. Procurement practices need to change.

<sup>298</sup> Andalusian legislation has recently been improved and is including CE besides waste management. The city makes no use of possibility to formulate local rules and regulations for CE.

<sup>299</sup> Advanced national legislation in terms CE is very supportive, according quick scan. Much higher taxation on landfill is being implemented.

<sup>300</sup> Cultural issues are hindering

<sup>301</sup> "a challenge to put CE in the minds of the population", awareness campaign to prevent illegal dumping of CDW in vacant lots and ditches.

## 4.3. Policy content

### 4.3.1. Presence of main policy discourse on CE, targets, communication

- Policy content is about objectives, why and how to get there. We observe differences between the cities in the degree of policy attention to CE. Porto and Sevilla have a specific policy document on CE. In Bodø there is a policy on CE for the new area under development. The policy does not concern the whole city, but the impact towards CE is nevertheless expected to be large because it is a vast area under development. It can be an important first step towards integration of CE into common working practices.
- With an incomplete elaboration in targets and actions and weak policy attention the transition to a CE seems unlikely. Without concrete targets, actions can't be properly focused, and no sound choice of data to gather and manage can be made, and there is no stronghold for monitoring and evaluation. Coalitions need shared targets and agenda setting for responding to challenges such as circular management of CDW or of BW from public space. Without time horizons for actions there is little stimulus to make a good effort.
- The extend to which CE ambitions are clearly related to different other sectors and ambitions have a positive impact on the work towards CE. CE is a complex challenge and rarely within the area of work of one department only. E.g. procurement, finance, social involvement are concerned, and for this, other departments than management of public space, environment or construction are needed as well. This requires specific elaboration and targeting. The roles of other such parties are quite well considered in Sevilla, Høje-Taastrup and Bodø policies. Porto and Mikkeli though, are focusing the involvement of companies and citizens as well (see 'cooperations' below).
- Whether and how the CE policy is actively communicated, e.g. via the city's website, in discussion in the city council, or towards citizens and companies, matters for awareness raising and enabling other parties to join in a coalition sharing objectives and resources. E.g. if a circular city declaration is signed but not referred in politics, its impact is bound to be much less, because it seems to not matter. In Mikkeli politicians have stated during a workshop in 2022 that the CE is important, this gives a signal to the others that the city is taking CE serious. In Apeldoorn CE is mostly mentioned between the lines as part of other policies. And the Cleantec Region concept has been set aside, and now the City Triangle frames the cooperation with the two other cities in the region. This means that the notion of cleantech is no longer communicated this way. On the other hand the city of Apeldoorn subsidizes several NGO initiatives for CE, which gives a different signal. Consistency in actions is needed to support well the transition towards CE. In Høje-Taastrup the officers have realized the importance of having a structure to fall back upon in the form of a coherent policy on CE. They are now developing the Sustainability Strategy with a CE component included, even though they were able to run a number of circularity initiative on own

force, using the trustful relationship with politicians. CE is a specific section in the Sustainability Strategy in the making. The office wide Sustainability group that has been installed in Høje-Taastrup can also communicate the message on CE being important. The Høje-Taastrup mayor is actively seeking contact and exchanging about CE with the big companies in the city. It is what we can call 'a discursive practice' influencing the mind set of other parties to engage in the CE. A communicative effort has been made in Apeldoorn to promote the notion of CE, like in the Zero Waste action week early September 2023. Mikkeli made a big effort with a very diversified communicative approach, targeting different age groups and user groups and using creative ideas.

- In Sevilla one of the interviewees refers however to the too simplistic interpretation of CE as recycling of waste. A new form of economy is needed, starting already with the first phase of the life cycle of products or with reducing the use of products. This notion is not yet widely established in Sevilla. In other cities this may also be a problem among part of the actors. The Bodø officer found that a reasoning that causes an impact is needed, 'like that we have to stay within the 1.5 degrees temperature increase', the carbon footprint. This may enhance the understanding of what CE is (also) about. Now the officer sees that in construction projects they just crush the houses or structures to move them to a waste management facility and re-use it as fillings, which is not upcycling. A well developed policy discourse helps to explain to actors in and around the city what CE is about and where changes are required.
- The 'sustainable building' strategy in Roskilde concerns own city property and is a core approach to developing CE. The communication on the CE and concrete options with builders seems however to also influence the builders' stance towards CE in a positive way. This may impact the construction for other parties than for the city only.
- We have noticed that during the last year of the CityLoops project still quite some progress was made in Bodø, Høje-Taastrup and Mikkeli in more explicit policy attention to CE. In Mikkeli CDW is now also having the attention of the city politicians and officers. In Sevilla, Høje-Taastrup and Porto the officers are using their cities' main policy ambitions as mandate for CE actions and to legitimate CE actions. In the other cities by absence of clear policy ambitions, there is less stronghold for this.

### 4.3.2. Carbon neutrality policy

- All cities have, however, a specific carbon neutrality policy. CE has an important CO<sub>2</sub> dimension. But prevention of resource use, reuse, recycling go beyond the energy component only. For discursive practices on CE, a CE policy is needed to which can be referred, i.e. what needs to happen and why, to make the transition to the CE. Without such an elaboration it is not obvious that there is sufficient understanding and attention at the level of city politicians and city offices of the challenges on the way to a circular city. Apeldoorn, Høje-Taastrup – though the sustainability strategy with a CE section is on the way – , Mikkeli, Roskilde (except for sustainable building) are lacking a specific CE policy.



### 4.3.3. Roles of multiple parties defined?

An encompassing vision on how to get a dynamic going of business' and citizens transitioning towards circular practices and on the role of the city in supporting such transition has been identified for Porto, especially with its competition demonstration action. Also, the guidance that the city provides to winning citizens or companies seems helpful to get these CE initiatives going. The Porto roadmap is also explicitly referring to the role of other parties.

- During interviews within the Apeldoorn area, the respondents assigned a substantial number of roles to the city offices of Apeldoorn. These roles can be recognized in the various demonstrations across CityLoops. They show the challenge ahead, even though some roles can be made lighter by cooperation with neighbouring or above-local authorities and with societal parties. They mentioned the following roles:
  - being cooperative: establish a local circular network for exchange of knowledge and information; Be a launching customer for struvite, rest warmth, wood building, wooden street furniture like signposts and guardrails; For local scale business cases a role in organizing and cooperating in the chain; As 'owner' of various waste streams cooperate in pilots and business cases.
  - facilitate: Be a mediator or first contact for marketing local, not new substances, materials and products, to raise their availability take a facilitating, "Yes, provided that"- attitude and possibly use the possibilities of the new Environment Code.
  - research and and management to support the development of the CE: Map local production chains to make clever links between demand and offer; Study effects of circular economy on waste tax; Financing research and pilots;
  - raise awareness: Organize information campaigns and raise awareness among inhabitants of short chains, circular economy and better sorting of waste (also direct feedback towards individual households); The previous combined with local branding and showing good examples; Involving youth and schools with circular economy.

### 4.3.4. Competing other policies

- In Apeldoorn, Bodø, Mikkeli and Porto growth policies may compete with CE policy attention. Apeldoorn wants to follow the national population growth targets and provide housing for this extra population. In Bodø and Mikkeli, being rather remotely located in the country, attracting and keeping young people in the area is important. Bodø piggyback rides on this policy, combining CE targets with social targets, and recently, integrating CE as a standard for the new district to build.

## 4.4. Cooperations

### 4.4.1. Internal within municipal offices

- Cooperation within the municipal offices was a challenge for all cities, considering the interview results. But during the CityLoops project progress has been made in several cities. Bodø, Høje-Taastrup and Roskilde officers are now linked to other departments via the permanent installation of interdepartmental groups in Bodø respectively the Sustainability Groups in Høje-Taastrup and Roskilde. This provides a basis for regular exchange, inspiration and influence across offices for more CE. They can have impact as coalition of like minded who cooperate towards CE and influence the rest of the organization.
- In all seven cities, departments in the social domain are referred as not yet well involved. This is explained by the nature of their work, which is focusing social targets and not the physical aspects of CE. But even at e.g. schools CE aspects occur, e.g. in terms of use of materials and management of buildings. The demonstration and environment officers make attempts to involve these departments. But it requires also a clear role definition and understanding. Social expertise is not merely a lever for coercing implementation of CE. During cooperation on CE social experts can bring in new insights and critical knowledge which may require different working practices.
- In Høje-Taastrup they worked on the improvement of internal cooperation procedures at the benefit of societal initiatives, so initiatives from outside the offices. From research (e.g. Aalbers et al. 2019 p91, Aalbers et al. 2015 p128.) we have learned that cooperation with citizens can be severely hampered if officers do not cooperate between departments. Citizens initiatives can be more integrative and depending from multiple municipal departments.

### 4.4.2. Cooperation with politicians

- Assuming that exchange between expert city officers and politicians can help accelerate innovations<sup>302</sup>, like towards CE, we have asked about the ease of contact between officers and politicians. In Høje-Taastrup, Mikkeli, Porto and Sevilla it seems more easy to exchange with politicians. In Apeldoorn, Roskilde and Bodø this is rare and the relation officers-politicians seems more hierarchical. It runs uniquely via the head of departments. This is also to protect officers and their work. Via articles and when an officer has an innovative idea and is invited by politician(s) to come and explain, officers can nevertheless influence the awareness of politicians and try to obtain support for new ideas in terms of CE.

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<sup>302</sup> This assumption was a reason to assess difficulty to exchange with politicians on CE negatively (red colour in the table). In a hierarchical culture expert knowledge from officers risks to not reach politicians.

### 4.4.3. Cooperation with citizens

- The Involvement and commitment of different stakeholders, such as private and public entities and citizens, throughout the BW demonstrations, was assessed as crucial by Cruces et al. (2023), authors of the demonstration report and responsible for the demonstrations. Apeldoorn's demonstration officer has connected to the communication officers of the city in the course of the CityLoops project. The Zero Waste action week in Apeldoorn to raise awareness is one of the actions in which these communication officers engaged. In Mikkeli, thematic stakeholder groups and regular meeting were said to be an effective way to cooperate with the stakeholder. Even short meetings kept the participants up to date and committed to the project (Malk et al. 2023). For BW there was in the first two years a 57% increase in separate collection, in the third year a decrease to 45%. The substantial effort by Xamk to communicate with stakeholders in Mikkeli on separate waste collection was effective. A longer communicative effort is needed to have an impact on the culture of waste selection among residents on the longer term.
  
- A standard approach for cooperation with citizens exists in Sevilla via a special board with citizens and companies to be consulted for approval, when social aspects are concerned by actions such as on CE. In Porto the cooperation with citizens has been well considered and is well developed in the demonstration actions where this is relevant. It compares to Mikkeli BioWaste actions' involvement of citizens. It is however not always obvious that the involvement of citizens goes further than advising citizens. And in Apeldoorn, citizens are considered rather as clients than as cooperating partners with own ideas and capacities. The service relation sets the tune: Apeldoorn at the service of its citizens. Also in Bodø the respondent suggests that better use could be made of citizens input. One can distinguish between communication with citizens to inform them and raise their awareness of CE; to get their ideas and contributions; or to request their approval, like happens in Sevilla for projects with a strong social component. The Seville approach with the special board that needs to approve of projects with a strong social component before it is submitted to the council might help to get a broader adherence of society. Discrepancy between politics, society and officers is a risk for the transition to CE because actions aren't coordinated and risk to waste human resources.
  
- Cooperation within offices and with citizens demands staff time and capacity. Resources for appointing staff to moderate and to connect between sectors, or to citizens (like the moderator ('kwartiermaker') in Apeldoorn or the compost master in Porto) should be reserved for this as part of the process towards CE. E.g. the communication officers in Apeldoorn were able to create more momentum in terms of the collaborative learning network and Zero Waste week. To further the transition to CE, their roles should be supported over the years to come.

#### 4.4.4. Cooperation with companies

- A classical form of municipalities engaging with companies is through public procurement and tendering. This way municipalities can influence the circularity of a project. The seven cities handle CE-principles in their procurements differently. Some are further than others in integrating CE-criteria into their municipal procurement standards. Secondly there are differences in the city's quantifying requirements, for example in the form of a minimum percentage of reused aggregate for concrete. Thirdly, in varying degrees the cities consulted with companies when developing circular procurement criteria. Porto and Bodø did so for example in workshops for their municipal procurement and Apeldoorn consulted stakeholders for their CDW-demonstration action. Input from the sector itself can help municipalities to better assess the state of the art practices and further their own understanding of circular principles. However, the question is if procurement is incentive enough for companies to switch to circular business models entirely. Likely not. In the end it is companies to reuse a bulk of materials and look for technical innovations. They don't only do that for municipal customers, and need to transition their way of working according to CE-principles.
- We see different levels of engagement with private companies across the cities. Beyond public procurement, several municipalities try to stimulate adaptation of CE-principles by companies (and citizens) with small projects and activities. Examples are Porto's competition on circular (business) ideas in the food system with support from the municipality as a prize, or Bodø trying to prove to companies that using CDW in construction can be economically beneficial. From the interviews with representatives of Porto we learn however, that transforming business models and ways of thinking is challenging. Especially when a project is based on funding and cannot come up with a sustainable business model in time, municipal activities are at danger to not generate the long-term/fundamental change they would like to see. True pricing seems a way to enhance the competitiveness of circular materials such as mentioned for the compost in Sevilla or circular CDW in Sevilla and Mikkeli.
- All cities made efforts to consult with companies as part of their CDW-demonstration actions, or as in the case of Bodø to collect input for their new procurement strategy. The willingness to engage with private companies varies. Some officers show a more traditional interpretation of the relationship with companies, with the municipality as client buying from companies as providers, as observed in Apeldoorn and Bodø. Nevertheless, both Apeldoorn and Bodø made also some efforts to consult with companies as part of their CDW-demonstration actions, or as in the case of Bodø to collect input for their new procurement strategy. At the other end of the observed spectrum we find cities that engage with companies on a high political level. For instance the mayor of Høje-Taastrup is engaging with big companies in the city on how to kick-start a transition towards CE in the city. There the municipality and some companies from the construction sector seem to have regular contact and seek advice from one another. In general the impression is that in Høje-Taastrup the municipality tries to nudge companies to apply CE-principles.

- As stated earlier, the municipalities try to fill gaps to make the circular market more or less functional. E.g. because a certain problem does not occur in a linear economic model, or to address the lack of a private player who is willing to take on a role or to provide a service that is necessary for the circular project. The role the municipalities can take may be subject to restrictions by law to prevent indirect subsidizing of companies that work with circularity principles so that they have a competitive advantage. Examples for this we find in Bodø where a municipality is restricted in the options to organize a (physical) marketplace for reusable material, or Høje-Taastrup where the municipality is not allowed to take over risks of a company, in this case the risk that reused pavement tiles may break prematurely. Thus, municipalities can support companies in some ways, but also depend on the companies' willingness to experiment and take risks. In Roskilde the municipal building department however identifies and takes the risk before tendering, in order to avoid high costs passed on via a company's offer when for instance it is uncertain that an environment permit will be given. For a city office it may be easier to get this organized before tendering. By doing so a company wouldn't have to insure the risk, which reduces the price of their offer. In Høje-Taastrup a pre-purchase development agreement ensured that a company got the advantage of the opportunity to re-bid with a new price after unsuccessful tendering.

#### 4.4.5. Cooperation with experts

- In all cities we find cooperations with external experts. But some are more sharp on their involvement: Porto involves many different expertises; Roskilde's demonstration officer continuously involves the university for monitoring the progress in terms of circularity, hires an ex-student who was involved in the CityLoops project; Seville includes experts via the board that also includes citizens and companies in certain projects; Høje-Taastrup engaged experts to specifically accelerate the use of recycled concrete mass when the contractor was hesitating because of possible risk involved in its use. The expert was guaranteeing the quality of the mass. For smaller cities hiring experts may be expensive. Cooperation with neighboring local authorities or higher level authorities may help. Expertise are together with facts and figures an important basis for sound policymaking and for monitoring and evaluating the transition towards CE. It links to data collection and management.

### 4.5. Resources

#### 4.5.1. Human resources

- Human resources, for example creativity of officers to have CE piggyback ride other policies, can play a role in making progress towards CE. When there are no explicit objectives stated in terms of CE in policies, it depends on actors in the city to propose targets and to hook up to whatever crochets (other) policies contain. It can



be politicians, officers, companies or residents or coalitions of these, to do so. For example, in Mikkeli and Apeldoorn there are employment promotion respectively growth policies that are referred as important or even competing with CE. These two policies may however offer nice hooks for including CE objectives and for starting mainstreaming of CE. Officers do at times take such an active and creative stance: In Bodø the officers combine CE with urban growth by interpreting growth objectives along CE lines. Eventually this developed into the circular ambitions for housing in the former military airport area. The officer also tries to show the business model. Such a pro-active attitude helps to accelerate progress. In Apeldoorn it was the initiative of the head of Public Management to engage in Bokashi production with consent by the council. Another officer asked for budget to appoint a moderator to materialize the Apeldoorn 2024 CE ambitions. This moderator developed a cooking book for the council with options to promote CE in Apeldoorn. In Roskilde rules for re-use of materials in construction of public property were developed by officers who also tactically influenced politicians by writing an article the responsible politician would come to read. But also ex-officers can directly get in touch with a responsible politicians and bring them up to data about actions needed.

These are examples of officers' attempts to make a (big) difference and initiate actions for CE, even if the council has not formulated CE targets in a policy or program or mentions CE in between other policy lines only. During discussion of the research findings, the Sevilla officer stated that influential officers are needed to make a stance for CE and convince organizations to engage in the transition towards a CE.

- Bodø is now demonstrating in the business model activities in CityLoops the advantages of CE. The municipal officer wants to showcase how CE might be economically beneficial. That might enable the municipality to push companies further. Bodø municipality thinks that using procurement as a strategic tool is the way to go.

## 4.5.2. Use of automated data and other tools

- Collection and management of data on circular activities of companies, citizens and cities is a challenge. We noticed the often indirect manner of assessing the kind and number of circular activities. Linking data to sustainable development, like Porto is trying to do, goes a step further. Porto, Bodø and Roskilde are having standard monitoring and evaluation practices, using GIS. Porto is working on its data collection and management together with the EU Joint Research Centre in order to be able to evaluate measures in terms of SDG impact. It is already standard to use GIS and other data and monitor impact.
- In Bodø the ambition is to establish a digital database that matches supply and demand for CDW and thus creates a market. This includes an overview of future projects, e.g. information on where and when soil will come free from building projects so that other projects can take these materials into account in their planning. Ideally the marketplace allows direct contact between projects so that transfer of materials can be easily arranged.

- Especially the demonstration report of Bodø elaborates on the challenges of matching supply and demand and how they try to deal with it. Providing the right amount and quality of the materials seems to be a key element. Some of the data is difficult to obtain or to gather from computer modelling and are therefore at present estimates. In addition to reporting on the material that is already available for reuse/recycling, Bodø also experiments with mapping resources in future demolition projects so that construction projects can anticipate on them being available. Although there are software companies involved in designing, improving and collecting/modelling the necessary data, at this stage the involvement of the municipality as a partner or launching customer seems crucial. Someone has to start filling the marketplace with material and to collect data. In the information we have from the participating cities, this role is fulfilled by the municipalities.
- Tools are developed to facilitate actions. For detailed information on tools we refer to the demonstration reports of the 7 cities. Some tools have already been copied and used in other cities, such as the Høje-Taastrup soil balance sheet that has been adopted in Bodø, Roskilde and Sevilla.

### 4.5.3. Financial resources

- In a situation of economic shrinkage the investment of finances and human resources to realize a CE may be under pressure. To get changes going, at least human resources are needed and they come with extra financial cost, unless officers can be shifted towards CE actions.
- Physically remote cities like Bodø and Mikkeli are challenged to keep young people and stimulate the economy. These other policy objectives may dominate CE policy. Than officers can try to piggyback-ride CE transition. We see examples of such bundling of policies in Bodø (interview) where the policy ambition to develop the civil airport project in a sustainable and circular way is added to policy objectives of markets for re-use that generate workplaces for the young and with further efforts to create an attractive living environment.
- Also Sevilla, Porto and to a lesser extend Apeldoorn and Roskilde show how different policies can be integrated and help limit expenditures. They do this for example by involving a sustainability group (Sevilla, Høje-Taastrup, Roskilde) that spans more or less all municipal sectors, by involving a civil group that represents social interests (Sevilla, Porto), or by referring to both social and CE importance during public procurement and assigning points for those in the evaluation of offers (Roskilde). Porto officers try and make the most of every euro by including CE targets in projects.

### 4.5.4. Storage area

- The two main gaps municipalities tried to fill within the construction and demolition sector are organising or facilitating a temporary storage for CDW that can be reused or recycled; and organizing or facilitating matching supply and demand for CDW.

Regarding the first, the temporary storage space, Apeldoorn already had a site for soil for decades, while Bodø just started with designating several sites for this. The idea is that the stored materials will quickly be used in another nearby project, in some cases the temporary storage might only be necessary for a few weeks (for example Høje-Taastrup CDW-demonstrations). In addition to the temporal storage facilities, several cities engage in setting up a permanent physical location where circular materials can be stored, e.g. from a material bank. This can happen in combination with exploring options for a digital marketplace to match supply and demand of materials. For Roskilde it was mentioned during the study visit that the geotechnical quality of the soil gets worse if you dig and store it outside in the rain. Parking underground was chosen in Høje-Taastrup because of lack of other space for parking. This brings a lot of soil excavation and transport with it.

- A speaker from IKANO confirmed that less compact cities allow for more space. In open land areas (new terrain) more is possible [in terms of circular uses and CO2 emission reduction in the demos] than within existing urban fabric.
- Also in Espoo (a replication city that wants to adopt CityLoops lessons) lack of space for locally storing soil was an issue.
- In Apeldoorn it was also a challenge to store Bokashi in the city. Cooperation with the outdoor park Apenheul allows the city to store Bokashi on the parking lot of the park during off-season.

## 4.6. Rules and regulations, informal and formal

### 4.6.1. CE as standard

- Informal and formal rules and regulations are core to institutionalization of CE. They mean that in working practices, behavior and choices, CE is the point of reference, the standard. In Mikkeli they find that CE policy goals need to be translated into institutional change and adopted as new practices in all relevant departments (procurement, environment, construction). More planning, including land-use planning, is needed to cater for upcycling and re-use of CDW with a better mass balance and lower CO2 emissions. In Porto, Roskilde and Seville we see a strong political will to engage in the transition towards CE and the support of national legislation. These are favorable points of departure for further institutionalization. Only, if local elections bring politicians that are not as supportive to CE, it may change the context for circularity actions. Furthering local rules, awareness raising and procurement practices can help to ascertain some tenacity and maintain positive context to CE.
- In Roskilde we did not find that the city makes use of its power to make local rules or regulations in view of CE. Local taxation of landfill with soil or concrete waste in Sevilla is an attempt to enhance the market for circular masses.

- In Denmark contractors need to pay 350 DK tax to deposit a ton of soil. That is why a farmer in the who had been allowed to accept soil from all over Denmark on his land, was eager to receive it. It even led to traffic jams and dirty soil being put there. The field had become a dump place for soil from all over Denmark and the farmer earned a lot of money with it. This was revealed when Høje-Taastrup started to use the soil balance sheet (Aalbers, Nov. 2022).
- A legislative barrier in Bodø is that they cannot store masses and materials if they are part of a demolition project. They cannot have an intermediate storage facility, because they need to treat the material as waste. This hinders the re-use of materials and masses, unless - the legislation says - you already have a project nearby that can use those masses and materials, then you can store them.

#### 4.6.2. Political willingness to engage in CE

- The cities differ in the extend to which politicians are proactively engaging in CE. In Høje-Taastrup the mayor is engaged in consultations with bigger, also international, companies about the transition towards CE, identifying bottlenecks, stimulating innovations towards CE. In Apeldoorn the situation has changed over time. First there was a responsible member of the daily governing body who was very motivated to engage in CE. But with his departure the CE portfolio became spread over three other members which did not do any good. Now again there is some energy on the subject again with a new councillor being chosen who is motivated to work on the CE. It is obvious that without a specific main CE policy and program the progress is depending on vicissitudes. According to the Sevilla demonstration officer there is need for a long term CE strategy in cities that do not change with elections and politicians. CE should become the standard.
- The main lesson learned according to Haapea et al. (2023) is that radical changes in municipal practices take a long time and they must be backed up with strategic decisions taken by political leaders and the leading civil servants. At the time when Mikkeli CityLoops project was planned such decisions and ambition were lacking. They only started developing parallel to the demonstration actions.

#### 4.6.3. Willingness in city offices to engage in CE

- The presence of a CE policy that specifies the roles of the different departments is important to get these other departments on board. The EC's selection of Porto as one of the 100 intelligent carbon neutral cities comes with a municipal policy to which officers are bound, which may stimulate a change of culture towards more carbon neutrality and circularity in the city offices. Porto officer(s) try to make the most of local resources in the city for contributing to CE. In Bodø, Høje-Taastrup, Roskilde and Porto the respondents found there is willingness in the city offices to act on CE. We expect that the installation of a Sustainability Groups in Roskilde and Høje-Taastrup contribute to the willingness of officers from the departments represented in the group,

to act on CE. In Bodø the three interdepartmental groups, each on different dimensions of CE and environment, have only recently been installed. Together with the policy document for the new district, which is politically committed and guiding, the interdepartmental groups in Bodø are expected to strengthen the inter-offices engagement in CE. These are all more recent developments.

- There is a difference in culture towards CE between the environment, management of greenspace, building, economic development and education departments within the cities of CityLoops. The departments involved in the CityLoops project learn and evolve in their practices. They do make efforts. The nice thing of the CityLoops sample of both BW and CDW demonstrations is that they bring these different departments to the table. They also show that in one city the building department is considered to be rather conservative (Bodø), while in the other city (Roskilde) they are considered to be innovative.

#### 4.6.4. Use of Public Procurement to promote CE

- Across the sample of cities one can observe differences between departments in terms of understanding of what circularity is about, in terms of critical reflection on one's own role within the various departments. Some critical departments, such as procurement or economic development lag behind, whereas the environment and greenspace sections or offices seem more aware and eager, but limited to their own field of action. A transition of practices within procurement and economy is probably more impactful, but also more fundamental and harder, because a different valuation of what matters or matters also (environment and social affairs) is needed. The Roskilde officer/head of department makes a meaningful observation in this respect, saying that if other values matter, other KPIs need to be put central in the assessment of contractors' offers during public procurement: 'Bidding, when lowest price is an award criteria does not make sense when environmental quality is a priority!' (presentation to the study visitors to Roskilde and Høje-Taastrup, November 2022).
- The use of public procurement to promote CE was a specific objective of the CityLoops project. Now, at the end of the project we see that most cities are in a process of institutionalizing this. In Sevilla procurement for CDW by EMASESA (water pipes) is following CE criteria. In Porto and Mikkeli sustainable procurement criteria are used. Mikkeli mentions explicitly that the circular procurement criterion goes for CDW, BW and other materials. For Roskilde it concerns CDW. For Apeldoorn the targets are still to be elaborated following the signing of the social responsibility in procurement manifest in November 2022.

#### 4.6.5. Local legislation in relation to CE

- Local rules in Bodø say that operators are to reuse material as much as possible. In Høje-Taastrup there are criteria in policies, e.g. parameters for pre-purchase development agreement that makes that companies are facilitated in re-using as much



as possible CDW. Porto and Roskilde find that the national legislation is enabling CE and they do not need additional local rules. Sevilla finds that the Andalusian legislation is limited to waste management only and not considering the lifecycle. This aligns with the worries about that CE is not well understood and considered a matter of waste management only (see policy content).

- The local competence to apply local taxation is used in Sevilla. By heightening the cost for landfill with materials that can be reused or upcycled, this helps create a market for circular materials.

#### 4.6.6. National legislation in relation to CE

- National legislation in Norway (Bodø), Denmark (Høje-Taastrup and Roskilde), Finland (Mikkeli), Portugal (Porto), Spain (Sevilla) is supporting the transition towards the CE.
- In the Netherlands the ministries seek a cooperative approach with companies in order to identify necessary room in the legislation which should lift hindrances for companies to engage in circular activities. In 2016 a number of bottlenecks have been lifted and the ambition is to further this approach. Instead of the former national waste plan now a national resources plan ('Nationaal Grondstoffen Plan') is in the making. Cooperation between enforcers and innovators is sought in order to develop workable, innovative situation for entrepreneurship in CE. Recently Rijkswaterstaat has commissioned a study concerning the 7 most important materials and principles for their circular use (EC Delft, 2023). The national Environment Agency refers the difficulty of the waste criteria that is still forcing innovators to demand a permission to reuse waste. The end of Waste criteria is not yet in force. As a result, companies that want to process these residual flows into new materials or products are obliged to apply for a waste processing permit. This creates additional administrative obligations and costs and makes investing in this circular strategy less attractive. (PBL, 2023)
- Danish legislation contains the 'end of waste criteria', 'incredibly handy' the respondent says. It is under the Article 28 and the key most important part. The criterion is useful when you lift waste out from the waste hierarchy, it is not building material nor waste. It is possession. If it is waste there's tons of regulations to fulfil and it is not making sense for circular actions. In the beginning of this change of the material to circularity this paradigm 'end of waste' provides room to act.
- A Porto environment officer finds however that the EU law on competition is hindering when the office wants to for example only buy locally or with sustainability criteria.

#### 4.6.7. Ways of decision making

- We asked the respondents to mention which ways of decision making were current: hierarchical, in consultation with citizens and companies, fact and figures based or focusing efficiency and involving companies to take on important part of the municipal

work. All four ways have their specific advantages and combining them while keeping an eye on the policy targets seems the stronger approach towards CE. We find this combination in Høje-Taastrup, Mikkeli, Porto, Roskilde and Seville. With hierarchical decision making the sharing of critical knowledge (Smith et al. 2015) from stakeholders and facts and figures are badly missed. Efficiency and leaving much choices to companies taking over part of the work of local authorities includes a risk for democracy. (Kaboolian, 1998)

- The Apeldoorn respondents mention the coincidences that certain companies in the city are part of networks and have connections and business relations that contribute to exchanges: WENL Head Office, Foenix, which is a circular handcraft company, Circulus which collect waste on behalf of Apeldoorn and other municipalities. They think it shows that networks contribute to raising ideas and influence by companies on decision making

#### 4.6.8. Awareness among citizens and companies

- Cooperation with citizens and companies initiatives can help increase awareness in the city and region. As stakeholders they require feedback (Claro et al. 2023) in order to become part of the development and feel ownership. Porto, Roskilde, Mikkeli mention good involvement of citizens as result of awareness campaigns. In Roskilde and Høje-Taastrup, consultations with companies seem to have become more common practice, and companies are agreeing that the change towards CE is what needs to happen. During a CityLoops Collaborative Learning Network meeting in Apeldoorn the same was said by one company delivering building materials: "We just have to do it!" The challenge to spread these insights widely across the city and region needs to be picked up in Apeldoorn. For Apeldoorn it doesn't help that the 'Cleantec region' concept is dropped. It is a concept that could have been used to mobilize resources from the wider society, i.e. both citizens and companies. Porto, Sevilla, Mikkeli who invested substantial efforts in awareness raising among the public, Roskilde and Høje-Taastrup cooperating closely with companies to increase CE business and procurement.
- Municipal politicians and of the public can not be seen as isolated unities, they are to a certain extend like communicating vessels. Politicians can set positive examples with CE discourses. According social structuration theory, actors can influence social structures, and vice versa. Which in more normal words means that by stories one can influence existing vested ideas and induce a change of appreciations of what matters. The Apeldoorn demonstration and communication officers have in 2023 made a film to raise awareness on CE by presenting the efforts of the municipality put into its circularity demonstration actions.
- At present the economic system still functions mostly in a linear manner. Working with the principles of the circular economy requires additional efforts from companies, for example a closer cooperation between one another when using CDW that comes free from a demolition project at another construction project. Generally speaking, all the cities try to fill gaps that occur when you want to work in a circular manner in a linear

economy. The degree to which they do that varies, though. Opportunities for cities to collaborate with companies and to achieve results on CE are dependent on the mindset and progressiveness of relevant companies and their general attitude towards CE in the specific sector. Across the cities the interest of local companies to work according to circular principles varies. In Høje-Taastrup for example the general interest of companies is rising. Some companies are actively working with CE, but do not get the chance to further develop their ideas as part of public projects, because the public tendering does not favour their approaches, e.g. because of too short deadlines for submitting tenders. In Porto the officers report that mainly big companies are interested in CE if there is an interesting business case to it. Several small companies and start-ups already work with a circular business model.

## 4.7. Physical context

- Two overarching issues regarding the physical context emerged in the research: (lack of) space - mainly to store materials - and the size of a city as a 'market' to buy and sell materials, so linked to a viable business model.
- Which scale is necessary for which type of demonstration action? If a project is feasible may then not only depend on the size of the city, but also the connection with and characteristics of the surrounding area: Is it a remote city in terms of distance or in terms of accessibility? Is it part of a metropolitan area with other partners that can become part of the cooperation, e.g. local authorities, companies or citizens' organizations?
- A specific physical issue encountered in relation to CDW and building is soil pollution. The polluted soil in Bodø, and especially the amount of it, due to historic events, but also subsoil remnants of concrete in the former concrete factory area in Roskilde. It can influence the business case of a project and decisions regarding the location of temporary storage, as an evaluation of different alternatives for mass treatment and transport at a road development project showed. They find that if the pollution can be treated, the mass can better be transported to a waste management facility, even though the distance is longer, than alternative locations closer to the city centre.

## 4.8. Economic context

- Not all CE projects depend on extra municipal budget and CE doesn't always have to cost more, respondents say.
- Those projects that are dependent of municipal budget can be at risk after CityLoops has come to an end, e.g. in Apeldoorn, Bodø, Mikkeli and Porto. For replicators this can be a point of attention. The size of the municipal budget can be critical. In Mikkeli and Bodø external funding is crucial. The officers of the city or employees of public company Miksei may go from project to project and this hinders long term development, like towards CE.

- The city economy can influence city budgets when local taxes are raised. Prosperity of the local economy can support city authorities' capacity to invest in CE, e.g. by staff like in Roskilde.
- A competing non-renewable resources market can hinder buying renewable resources. True pricing can be a way to counter this. In Mikkeli and Seville such competing markets are referred. Seville is now raising taxation on landfill, taxes are multiplied with a factor 2.5. Local taxation is an instrument within reach of cities, whereas true pricing is probably only effective when done at national or European level.
- CE doesn't have to cost more in circular procurement, if the price is fixed and bidders are asked to compete on the circularity and other sustainability aspects.
- The public may appreciate city expenditures on 'social goods' more than on CE: schools, kindergarten, and then on climate action, like in Høje-Taastrup. Piggyback riding of circularity on such projects may be a way to still progress in terms of CE, like Bodø does with its new district: it is agreed in the council it will be a circular district. And to influence public preferences, awareness campaign – continuous information, explaining the importance of CE - could help.
- In Roskilde in the City Council's 2022 budget agreement circular building is budget wise among the main foci: 5-10% of construction in the budget agreement is associated with circular construction. Economically, Roskilde is a prosperous city and this probably enhances the possibility of the local authority to invest own budget in circular building.

## 5. Suggestions for upscaling and replication

**What do presence or absence of these means of influence mean for upscaling in the city and for adopting the demonstration actions elsewhere by other cities?**

We use the rich information from all cities together to make suggestions for improvement as a check for any city that endeavors to adopt the demonstrations and to make progress towards a circular city.

The CityLoops cities miss a full framework with policy discourses, cooperations, resources and, rules on CE, that can structurally back up initiatives by officers and society. The four categories of means of influence are distinct and can not replace one another: they are complementary sources of influence. Without these provisions, initiatives risk to be incidents rather than part of a city system wide approach. With the inspiring demonstrations and understanding the importance of the framework of means of influence, other interested city authorities and communities have at their disposal the essential material needed for making their city circular, as much as is possible within its limited geographical and administrative confinement.

We now present the most important conclusions, without going into the details that are already obvious from the comparison in chapter 4 and from the seven tables per city in chapter 3.

1. Political support is at the basis for the transition towards a circular economy. Awareness raising about the importance and meaning of CE should target politicians, but also the electorate that votes them or not.
2. Assessment of progress and actions for CE requires monitoring, requires data, requires investment in data collection. Specific CE policy is needed and should still allow for integral working and piggy back riding on other policies. Set quantitative targets and simultaneously specify relations to other sectors and parties.
3. As concerns cooperation: life chains of masses and materials touch upon / depend on many stakeholders, from producers to consumers. Social expertise is a prerequisite, in addition to technical expertise, to effectively coordinate the desired transition with them.
4. Also between city offices this coordination is needed. An interdepartmental sustainability group like in Bodø, Høje-Taastrup and Roskilde, is a medium to inspire and influence and eventually coordinate shared actions towards CE. The positive stance of heads of departments is conditional to success of such interoffice cooperation.
5. Financial resources are by nature restricted. Seeking cooperation with neighboring or above local authorities such as metropolitan region, province or region can help share costs and expertise.
6. Human resources are important for the transition to CE because practices and rules/regulations need to be changed. This demands pro-active influential officer(s),



rightly not the more following type of officer but a change maker, communicator and collaborative person.

7. CE asks for preserving space within the urban/urban regional tissue for production of biogene materials, and storage of masses and materials. Rethink the compact city paradigm.
8. EU legislation is appreciated by the cities. Nationally member states should act timely instead of putting targets at the long term. True pricing is important as well, for creating a market for circular materials and products. Locally also the pressure should be kept on, because resource scarcity and the important role of CE for carbon neutrality which is highly urgent. This brings us back to the importance of politicians who stand up for CE, see point 1.

During the interviews we have asked about ways of decision making. Respondents often mentioned that all four types of decision making existed. On the basis of the research we find the following specific contributions that each of the four ways can have for making the city circular.

1. For consultation based decision making, interaction of politicians who are open to discussion with societal partners and mutual respectful involvement are conditional. It leads to sharing insights and understanding of each others concerns and wishes, and challenges to CE. Ultimately this should lead to better CE actions.
2. A data approach is important for fact and figures based decision making. Sharing data with societal parties supports the cooperative approach to decision making.
3. The hierarchical line is relevant for achieving the CE, in terms of standing up for CE and demanding performance of city offices towards CE. The data approach is supportive if not conditional to assessing performance.
4. Public management approach, hiring external expertise to support data system development, technical know how on circular solutions and consultations where internally this expertise is not available.

## 6. References

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# Annex

## A.1. Data collection

### *Quick scan 2021 of the contexts in the seven cities of the demonstration actions*

In preparation to the online CityLoops General Assembly of 2021 a quick scan was done of the contexts and means of influence employed in the demonstration actions. On the basis of some general questions (5.3) the factors influencing the demonstration actions in the cities, were given by the officers/experts from each of the seven cities. The questions posed were put in plain language together with a demonstration officer from the city of Apeldoorn, in order to avoid too theoretical formulations that might not connect well with practice. And by way of example the answers from the city of Apeldoorn were put on the slides to give a clue about what was meant and how little work was needed for the officers from the other cities to answer the questions. The questions referred to culture, economy and politics - i.e. the sub-systems of the social system - and to the physical system of the city (Kleefmann, 1984).

To evoke the recognition that each city has its own specificities, the Apeldoorn officer suggested to depict the cities with the wrong pictures, i.e. of other cities, in order to make the city officers think: 'No, this is not what our city is like. Our city is like this and that.....!' We did so in order to make the city officers think about differences with other cities. Also the question 'Who are your partner cities?' was added in order to evoke the thinking about the others. For EU projects it is important to see wider than the local situation because the insights gained with European public money should also benefit other cities.

Other questions were about culture and practices: 'What do you do when the mayor calls? What happens when an officers calls an officer from another department?' More general was the question 'What aspects support your demonstration actions most, what least or even form a hindrance?'

The quick scan approach was 'quick and dirty'. The cities could fill in the slides in an hour or so. However, it evoked enthusiast discussions which suggested that the issues were recognized as relevant and important. Maybe it was also a relief to some officers that other cities faced difficulties as well. The answers are presented in the appendix.

During the analysis the factors were categorized according to policy context and means of influence used (see 2.4 Theory). Outspoken marks for support versus hindrance were coloured to draw attention (see Appendix). The diagrams were presented as slides and discussed during the General Assembly. The discussion evolved around differences between cities in terms of formal hierarchy, cooperation culture, and in difference between what is on paper (policies) and what is done in practice. We discussed what these issues mean for becoming a Circular City, or for successfully implementing the demonstration action. The quick scan results are also referred in chapter 3.



## *Interviews of city officers and external expert involved in the implementation of the demonstration actions*

The list with interview questions was formulated by WUR on the basis of research question 1 'What are systemic factors that influence the progress in the CityLoops cities towards becoming a circular city?' Interview questions were formulated for each type of (sub)system (Kleefmann, 1984):

- political and policy,
- cultural,
- economic,
- physical.

Subsequently these interview questions were to be discussed during an online focus group meeting with the cities, company and knowledge institutes involved. But there was limited reaction and rather consent with the approach.

During the interviews some variations in the way the questions were put developed. These variations were all noted down in the interview reports and subsequently noted down in an excel table, on the basis of which the results section (3.1) has been written.

A list with criteria for the selection of respondents was established and discussed with the demonstration action officers, in order to choose interviewees that are best informed to answer the questions: interviewees should have over 5 years experience in CE projects and they should be knowledgeable of the CityLoops demonstration actions in their city. 10 representatives have been interviewed. All respondents (Annex 5.2) were municipal officer except for Mikkeli, where an expert from Miksei Development Company<sup>303</sup> was interviewed. From four cities only one representative was interviewed. From Høje-Taastrup, Apeldoorn and Porto two representatives were interviewed simultaneously per city. The city partners in charge of managing the demonstrations were suggested for interviews and sometimes complemented with a head of department. Interviews were recorded with consent by the respondent, and the report of the interview was approved by the respondent. We used a semi-open interview approach that leaves room for elaborations from the side of the respondents, but also for deepening questions by the interviewer. Finally, for Bodø the respondent had 3 years experience working in Bodø instead of the required > 5 years criteria.

The interviews happened in the course of 2022 and early 2023. It took so long because the respondents faced an overload of project activities. So, the CityLoops coordinator asked to delay some interviews. The interviews were done online, except for Roskilde. See the interview guideline in annex 5.3.

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<sup>303</sup> Miksei is however 90% owned by the city of Mikkeli and the employees are cooperating with Mikkeli officers on mostly 2 years project basis.

Also the lessons learned accumulated during the work session organized by Edwin Keijzers between the BioWaste demonstration cities in January 2023 have been used in this report. During the session were discussed the effectiveness of the demonstrations, the impact of ideas and of the CityLoops project in general, the progress in terms of collaborations and with whom.

*Literature study: policy documents, demonstration reports*

Literature study consisted mainly of reading of the demonstration reports of each city, to support the analysis of the interviews. Information on the means of action employed in the demonstration actions is mostly derived from these demonstration reports. Information on the involved parties in the demonstration actions also comes from the interviews.

We are not focusing on the individual demonstrations to the same extent as the demonstration reports do. We are rather comparing the cities on their social and physical context and the actions taken, in order to explain the success or problems of the demonstrations and the overall progress of the city towards CE.

Also policy documents and local studies were consulted, searching the city's English websites with search terms 'environment', 'circular', 'climate' and 'policy' respectively. This provided more insight in the policies and political importance adhered to those policies.

## **A.2 Participatory approach**


A participatory approach to the research has been adopted, in order to enable input from the practitioners, mostly managers of the demonstration actions in the cities. This normally enhances the relevance, comprehensibility and thereby usefulness of the results for practice. The exchange with the cities was organized along the following actions:

1. Presentation of research questions and interview questions to a representation of the CityLoops cities especially the demonstration managers, and discussed and added upon (16 March 2022, WP2). Later on the research questions were sharpened e.g. by deleting redundant words and the comparison and link to the impact of the actions was included.
2. Criteria for the selection of respondents were established in cooperation with the demonstration managers. (16 March 2022, WP2)
3. Respondents were selected and contacted in consultation with the demonstration managers (started 16 March 2022, reminder sent 2 May 2022 for remaining 6 cities). N.B. not all respondents were demonstration officer.
4. Results per city (section 3.1 and 3.2) discussed with respective demonstration manager and occasionally additional practitioners from the city; preliminary analysis in tables discussed in a focus group session (online summer and autumn 2023). Final

tables and references checked and complemented by mostly the demonstration managers. City descriptions checked via email correspondence.

## A.3 Slides with quick scan questions


The following slides were used to evoke a discussion on the city context and on the actions of the CityLoops cities during the online General Assembly of the CityLoops project in 2021.



# Who's in your consortium

Carmen Aalbers, Adriaan Hellemans, Sander Lubberhuizen, Petra Bennink, Edwin Keijzers

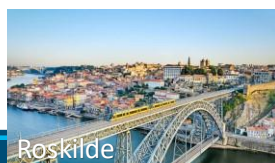
Your name and organisation: .....





**The context of your CE actions?**

What can you tell about your city?



## Turning into a CE city

What aspects do support your actions to become a Circular Economy City most (score 1) and which least, or even form a hindrance (score 4) ? Organize the four below from 1 to 4. Keep one of your business cases in mind as example.

- The physical system. (This is about how your city or city region is structured, and about in which type of neighbourhood your business case is situated: densely build, highrise buildings, or with much private or public green space ...)
- The political system. (This is about how decisions are being made in your city, or about the kind of decisions that are being taken by your city government.)
- The cultural system. (This is about how citizens and companies in your city feel or think about waste, about circularity and or (natural) resources.)
- The economic system. (This is about the availability of finances, efficient use of scarce materials, whether companies or the city government are in charge and take the risk in the business case.)

During the GA session we will ask you to explain and we will identify differences and similarities with other cities. See next slide

3

## Comfort and discomfort

Which things do comfort your attempts to become a Circular City? The example below goes for Apeldoorn. Mention the three for your city. (replace the sentences below by your own answers).

1. The city owns much of the land - so it can manage and decide rather independently -, and owns the results of the business cases.
2. High quality and maintenance level of materials and real estate.
3. ....

Which things discomfort your attempts to become a Circular City? (idem)

1. The habit of 'polderen' about really everything (too much bottom up because ...)
2. Rules and regulations. (to change it we have to engage with the national Ministry)
3. We are commissioner and contractor at the same time, which reduces our impact

4

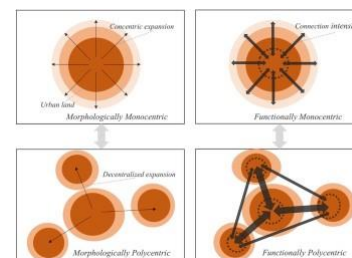


## City structure and city's role in the wider region

- Big monocentric, or small, part of a polycentric large agglomeration?
- Importance of city in the wider agglomeration in terms of: area, of setting an example, of power? .....
- Population :
  - Number of inhabitants: .....
  - Inhabitants per km<sup>2</sup>: .....
  - Number of civil servants: many or few? .....
- Immigration or emigration of people? .....
- Highrise, medium high, detached/semi detached houses? .....

**Extra on culture:** 2 issues characterizing the work practices in your city hall:

- When the mayor calls: I will call him back later? Or I immediately run to his office?
- When an officer contacts another city department, she/he runs into problems with the boss? Or, we are stimulated to cooperate with other departments?



5

## A.4 Answers by cities to quick scan questions

### WHEN THE MAYOR CALLS

In Seville, Bodø, Porto and Høje-Taastrup: ...  
I will run immediately to her/his office

Mikkeli: ..., I don't know, he never calls 😊

Apeldoorn: I will call him back later a.s.a.p. If needed I will run to his office.

Roskilde: I prioritize this since he's appointed by the citizens.



### TASTER

### COOPERATION

Bodø: When an officer contacts another city department (s)he will run into problems and at the same time we are stimulated to cooperate with other departments

Roskilde: We are stimulated to cooperate with other departments especially regarding sustainability.

Porto and Seville: When an officer contacts another city department she/he will NOT run into problems, but will be stimulated to cooperate with other departments

Høje-Taastrup: We cooperate with other departments

Apeldoorn: When an officer contacts another city department she/he will not run into problems, but will be stimulated to cooperate with other departments if it is included in the multi year budget.

3

Taster on municipal office culture

What aspects do support your demonstration action most (score 1) and which least, or even form a hindrance (score 4) ?



	Apeldoorn	Bodø	Høje-Taastrup	Mikkeli	Porto	Roskilde	Seville
Physical system	1	3	2	2	1	1	1
Political system	4	1	1	4	3	3	3
Cultural system	3	2	4	2	4	4	4
Economic system	2	4	3	3	2	2	2

5

System that supports most and least

## Which things do support your demo action



- Seville:
  - Advance in meeting European recycling and recovery targets.
  - The local administration of the city is committed to the development of actions under the scope of the Circular economy.
  - There is a need to renovate much of the city's pipeline infrastructure.
- Porto:
  - The City of Porto has a strategy for Bio waste described in Roadmap for circular city 2030.
  - Porto city is the main actor of collection and treatment of waste in Porto.
- Høje-Taastrup
  - We have many ongoing building projects, so a lot of opportunity for flow of materials.
  - There is political willingness to move towards circularity.
  - There is openness to bottom-up initiatives like ours.
- Mikkeli:
  - The Circular City Declaration
  - High quality and maintenance level of materials and real estate.
  - CityLoops and other circular economy projects
- Bodø
  - Knowledge and competence from local partners: NRI & IRIS
  - Common agreement in municipality of the importance of a circular & sustainable treatment of CDW
  - The improvement public procurement routines in Bodø Municipality
  - Bodø Municipality owns the land where the demonstration project is to be practised
  - Technical solutions that helps us make data based decisions: 3d tool, LCA
  - The practice of stakeholder & inhabitant involvement using the CityLab. Engaged citizens and organizations.
- Roskilde:
  - The city acts as building owner and developer.
  - The marked accepts the new order and need for circular innovation
  - We have to do it....
- Apeldoorn:
  - The city owns much of the land so it can manage and decide rather independently
  - We will own the results of the business cases.
  - High quality and maintenance level of materials and real estate.

6

Supporting factors for each city. Resources are coloured in orange, cooperation issues in green, policies and culture are underlined, .

## Which things hinder your attempts to become a circular city?

<p>Seville:</p> <ul style="list-style-type: none"> <li>Collaboration between public companies and between public and private actors must be further enhanced.</li> <li>More training and capacity building is needed (at civil servants, companies, citizens, etc.).</li> <li>There is a virgin materials market, close, and competitive.</li> </ul>	<p>Porto:</p> <ul style="list-style-type: none"> <li>The cultural part, because the population of Portugal are not aware of the <u>Extended Producer Responsibility</u>.</li> <li>The national regulation are instable and the definitions are not clear.</li> </ul>	<p>Mikkeli:</p> <ul style="list-style-type: none"> <li>Some stakeholders must invent and have invented the circularity by themselves.</li> <li>We can't change rules and regulations (to change it we have to engage with the Ministry and Parliament).</li> <li>is a small city, struggling with its costs and income. People still think CE rather creates more costs than reduces them.</li> </ul>	<p>Høje-Taastrup</p> <ul style="list-style-type: none"> <li>Outdated laws that mean using recycled materials comes with a perceived risk.</li> <li>CityLoops position administratively in the organisation has limited influence.</li> <li>Force of habit making it easier for actors to do as usual instead of something new.</li> </ul>	<p>Bodø</p> <ul style="list-style-type: none"> <li>Financial risk, i.e. circular business models.</li> <li>Fear of the unknown.</li> <li>Hard to implement new solutions/innovation in established practises.</li> <li>Bureaucracy.</li> <li>Refusal to change.</li> </ul>
<p>Roskilde</p> <ul style="list-style-type: none"> <li>Too many "we are used to" solutions.</li> <li>Lack of willingness to risk.</li> </ul>	<p>Apeldoorn:</p> <ul style="list-style-type: none"> <li>Lack of focus. Ambitions are sky high and if possible, in every subject.</li> <li>We can't change rules and regulations (to change it we have to engage with the national Ministry).</li> <li>Apeldoorn is commissioner and contractor at the same time, which reduces our impact.</li> </ul>			

7

Hindering factors for each city. In blue: collaboration issues, in yellow: rules and regulations, in orange resources such as knowledge or financial resources, underlined: (change of) culture, within own organisation or among the public.

Some issues are related or appear in two categories: outdated laws that bring a perceived risk, but also about willingness to take risk and to cooperate and come to agreements on temporary experiments and exceptions. E.g. Apeldoorn with its Bokashi experiments, faces this legal situation but takes up negotiations with the Ministry.

Cultural issues: Sevilla and Porto: the culture with regard to biowaste hinders, but the physical system (highrise/medium high building) supports the introduction of biowaste containers.

Opportunities for progress by cooperation, but cooperation can also be very problematic is everyone needs to talk and agree with everyone. No decision making power can also be a problem. Netherlands. Maybe running when the mayor calls has its advantages. What do you think?

This slide shows where you can learn from each other: Questions:

- in blue: what's in it for whom when you collaborate, where are the joint interests, what are the disadvantages for getting your demonstration action going, for becoming a circular city
- in yellow: joint action about legislation to change? as a project?
- in orange: resources:
  - how to go about lack of budget, other types of solutions? shrinking cities accompanied with the lack of resources, more European cities in this situation.
  - do you develop argumentation for circularity in terms of financial sustainability?
- in red: about culture and presumptions. what is known about this already? transition theory is relevant here., relates to the previous, cultural issues, but also physical, to bureaucracy as working practice/habits...

Zie slides van deze presentatie uit 2022 in Sevilla. Interessant materiaal mbt de tools en demonstrations en vergelijking steden op hinderlijke en helpfull factoren met slides 2021 wat inzichtelijker

## A.5 Interview guideline

By Ir. C.B.E.M. Aalbers PhD, and Drs. N. Nuesink, Wageningen University and Research, Wageningen Environmental Research, March 2022

**Explain the goal of the interview:** With this interview we would like to get more insight into the characteristics of the CityLoops cities - and if time allows how these influence their demonstrations. On the basis of these insights we will categorize the cities. This categorization can be used in the upscaling e.g. by other cities to decide which projects might be interesting to implement in their own city, while comparing these categories with their own city. It also helps other cities to be aware of the potential challenges to take into account when implementing a certain project from one type of city in their own city. And the outcomes could be relevant to formulating policy recommendations in WP7 for supporting cities to become circular.

### Administrative issues

- We would like to record the interview to use for the interview report later on. Is that okay with you?
- The interview will be treated confidential (no person names are used in the final report, only organizational names).
- We will send the interview report to you when it is finished, you will have the possibility to respond to this interview report.

### Introductory questions

2. Can you introduce yourself, describe yourself in a few words as a person? Who are you and what is your role (tasks & responsibilities) within your organisation and also in relation to the CityLoops project? How do you see your role, as a person in this process?

### Systemic factors

We look into 4 systemic factors that might influence the progress towards becoming a circular city and the implementation of your demonstration in specific. In the following questions we would like to zoom in on these four systemic aspects for your city, namely: political, cultural and economic. For the physical aspects we have a description we would like to have checked by your city planning department.

The political system: *This is about the way in which decisions are being made in your city, and about which policy decisions are being taken by your city administration.*

3. Which are the main ambitions of your city government? (maximum of three ambitions)  
Do they have an impact on becoming a circular city? And if yes, how?
4. What are the city governments ambitions in terms of circular economy? Where is your city on a scale from 1 to 10 in terms of becoming a circular city? 1 = at the very start ; 5 on the way to and made substantial progress; 10 = circular (theoretical, practically impossible). Explain what motivates your answer?
5. What does the process to take a decision in your city look like? What steps need to be taken and who is involved, to decide on a policy for circularity? to decide that a demonstration will (not) be enacted in your city?
  - How would you characterize the way that those decisions are being taken in your city?  
*top down and very political, or*
  - *knowledge based, sensitive to facts and figures*
  - *in consultation with residents and companies, or one of these two groups in specific?*  
*Lots of lobbies going on?*
  - *efficiency, public management attitude?*
5. In what way does this decision taking style influence the implementation of the demonstrations in your city? Do you have an example? (does the political system in your city make it easy to implement the demonstrations? Are there obstacles because of the way that the political system is in place in your city etc.?)
6. Is there political will in the city council to become circular? How do you notice this?
7. Does the city council support initiatives like the CityLoops demonstrations? Explain, and if yes in what way?
8. Is there a policy and/or their legislation that helps you implement the demonstration, or on the contrary, is there policy and/or legislation (local or above, like national or European) that hinders the demonstration? Please describe how this works: in what way does it help or hinder?

The economic system: *This is about the availability of finances, efficient use of scarce materials, whether companies or the city government are in charge and take the risk in the business case.*

9. What is the current financial position of your city? (growing or shrinking economy)
10. How does this financial position influence the implementation of policy plans of the city?
11. Does it effect the CityLoops demonstrations? How?
12. How does the private sector relate to your CityLoops demonstrations? are they involved and in which way? How strong or weak is the willingness of companies in your city and region to contribute to a circular economy and what insights motivate your answer?

The cultural system: *This is about how citizens and companies in your city feel or think about waste, about circularity and/or (natural) resources.*

13. How would you describe the culture within your city offices? strongly innovative? conservative? top down?... Choose your own terms to answer this question.



14. How responsive are citizens to your demonstrations? How strong or weak is their willingness to contribute to a circular economy and what insights motivate your answer?
15. What parties are involved in your demonstrations? And what are their roles in the demonstrations?

The physical system: *This is about how your city or city region is structured, and about in which type of neighborhood your business case is situated.*

We present first results on spatial layout or structure of the city, building density or compactness, and size of the city, amount of public and of private greenspace in the city (from General Assembly 2021 and desk research by WENR) and ask the respondent to have it checked by the City Planning Department

16. How do the physical characteristics of your city support the implementation of the demonstrations in your city?
17. Are there spatial developments that are especially relevant to your demonstrations? Please explain, using examples from all demonstrations in your city. (Do you see any bottlenecks from a physical perspective to implement the demonstrations? Do you see any (unused) opportunities from a physical perspective to implement the demonstrations?)

Summary city data for check by the city planning department to be included here below before the start of the interview.

## A.6 List of respondents per city and their function

Interviewed 9 respondents. When two respondents are referred, these were interviewed simultaneously.

City	Respondent	Date interview
1. Apeldoorn	1. Leader of Waste and Environment section of municipality of Apeldoorn; 2. Subsidy advisor and CityLoops <i>demonstration manager</i> BioWaste of Apeldoorn municipality	4 April 2022, online
2. Bodø	1. Project manager CityLoops Bodø/ <i>demonstration manager</i> Construction and Demolition Waste Bodø municipality	25 November 2022, online
3. Høje-Taastrup	1. CEO Environment Department of HT municipality; 2. Environment engineer of HT municipality and <i>demonstration manager</i> Construction and Demolition Waste	18 August 2022, online
4 Mikkeli	1. Development manager Miksei, a Development Company owned 90% by city of Mikkeli and <i>evaluation manager</i> for the CityLoops demonstration	23 November 2022, online
5 Porto	1. Head Environmental management office of Municipality of Porto 2. Officer of Municipality of Porto, responsible for implementing roadmap circular Porto of 2030 NB demonstration manager is with Porto Ambiente, the Environment company of the city of Porto	21 July 2022, online
6 Roskilde	1. <i>Demonstration manager</i> and head of Sustainable Building department of Roskilde municipality	1 December 2022, live
7 Seville	1. General director Seville municipality for the corporation of the public services in the city of Seville (LIPASAM, EMASESA, ...) NB demonstration manager is at LIPASAM	20 April 2022, online



CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and organic waste (OW), where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and OW, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.



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