Circular City Governance

An explorative research study into current barriers and governance practices in circular city transitions across Europe

Colophon

EU Urban Agenda

The Urban Agenda for the EU is a new working method to ensure maximum utilisation of the growth potential of cities and to successfully tackle social challenges. It aims to promote cooperation between Member States, Cities, the European Commission, and other stakeholders to stimulate growth, liveability, and innovation in the cities of Europe. The EU Urban Agenda targets a wide range of urban themes. One of these themes is the Circular Economy which is addressed by the Partnership for Circular Economy.

Partnership for Circular Economy

The Urban Agenda Partnership on Circular Economy (UAPCE) consists of representatives of six urban/regional authorities (Oslo, The Hague, Prato, Porto, Kaunas, and Flanders Region), four member states (Finland, Poland, Slovenia, and Greece); the European Commission (DG REGIO, DG ENV, DG CLIMA, DG RTD, DG GROW, and others as appropriate for consultation); and other organizations (CEMR, EUROCITIES, URBACT, and EIB). The city of Oslo is the coordinator of this partnership. Its task is to identify, formulate, and implement actions to promote the transition to a circular economy in European cities with better knowledge, better regulation, and better funding.

Role of the EIB

The European Investment Bank (EIB) commissioned the work presented here. EIB is the financing institution of the European Union. Created by the Treaty of Rome, its shareholders are the Member States of the European Union, and its Board of Governors is composed of the Finance Ministers of these States. The EIB enjoys its own legal personality and financial autonomy within the Community system.

The mission of the EIB is to contribute to the policy objectives of the European Union by financing sound investment as laid down in its statutes and in the decisions of the European Council.

Within the framework of the Urban Agenda CE Partnership, the EIB is in a leading role in the working group dedicated to the “Circular City Governance” theme. Other leading members of the working group are the Flanders Region (represented by OVAM, Public Waste Agency of Flanders) and Slovenia (represented by the Ministry for the Environment and Spatial Planning). The “Circular City Governance” theme, which has been identified as being crucial to the further development of the circular economy, focuses on the common issues, barriers, and drivers that can be found across all of the other (vertical) themes with an intent to address the broader question of what 'conditions' are required to ensure that circular economy thinking becomes the norm in cities and how collaborative governance could support circular city developments.

Acknowledgements

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Executive Summary

The circular economy (CE) represents an alternative to the currently predominant linear 'take-make-waste' system, which is characterized by a wasteful and degenerative use of resources. In a circular economy, products, components and resources are maintained at their highest level of value and utility and kept within closed loops for as long as possible while waste generation is minimised. Interest in the CE of various stakeholders (policy makers, businesses and financiers) has been growing rapidly over the past decade. More and more sectors and value chains are explored when it comes to their relevance for developing a CE. Specifically, interest in the role of cities in the CE has expanded substantially, as cities concentrate much of the resources used in the economy as well as hold critical concentrations of business activity, human capital and regulatory/administrative capacity needed in crafting the transition to a circular economy.

In the context of the EU 'Urban Agenda' initiative[1], a Partnership on Circular Economy (referred to as UAPCE) has been set up to look at ways and means to support the transition to the CE in European cities through *better knowledge, better regulation* and *better funding*, which represent the three pillars of EU policy making and implementation. The main objective of the UAPCE is to identify, analyse and recommend concrete actions in these three areas to help cities strategically shape, organise and accelerate the transition to a circular city. The theme of 'Circular City Governance' was identified as crucial to the development of an 'urban' or 'city-based' CE and therefore addressed by a distinct working group, in which the European Investment Bank (EIB) took a leading role.

Circular City Governance - An explorative research study into current barriers and governance practices in circular city transitions across Europe presents the results of an empirical research study carried out by a team of the Nijmegen School of Management, Radboud University Nijmegen (The Netherlands), commissioned by the EIB. The research activities ran from October to December 2017. The main objective of the study was to support the EIB and other members of the UAPCE involved in the working group on "Circular City Governance" (CCG) with the identification, analysis and elaboration of actions in support of *Circular Governance in Cities,* particularly through *better knowledge and better funding.* At the time this report was completed, the UAPCE's Action Plan had been recently published for public consultation[2].

The research study follows an empirical approach primarily focussed on the identification of (i) the most common barriers and challenges that are encountered by cities seeking to promote the circular economy, and (ii) the most important governance interventions cities have taken to initiate and advance in the transition to a circular city. This information is obtained from the analysis of selected case studies of circular economy projects in urban environments, various publicly available circular economy strategies and plans elaborated by cities and interviews with experts and officials of front runner cities that have embraced CE agendas across Europe. The results of this research study should contribute to improve the

[1] See https://ec.europa.eu/futurium/en/urban-agenda
[2] See https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_draft_action_plan_-_final_09.02.2018.pdf

general knowledge basis on the promotion of the CE in cities by presenting the experiences made and main lessons learned by cities at the front of the CE agenda.

The Circular Economy in European Cities

Even though interest of cities in the CE has been on the rise over the last few years, the research shows that the development of the CE in European cities is still in its infancy and only a few front runner cities can be identified. Most of these front runner European cities that have embraced more comprehensive CE agendas are often still strategizing the CE in their specific context. An even smaller group of cities that have developed a dedicated strategy or devised roadmaps for the CE have moved a step forward towards the actual implementation stage which is often limited to experimenting with pilot initiatives, programmes and projects. For now, there is no long-term or comprehensive empirical information available on the implementation stage, which explains why the results of this research can only provide insights into the most common barriers and good governance practices of cities that are just *in the initial stage* of the transition to a CE.

The research has provided the following insights into the most common barriers encountered by front-runner cities (grouped for each of the three pillars of EU policy making and implementation):

Better knowledge

- **Insufficient or lacking political support is a major barrier to circular economy developments.**
  One of the most crucial factors enabling the transition to a circular economy is support for long-term circular ambitions at the right institutional levels. Without back-up and active support at the political level, promoters of circular economy initiatives will remain isolated and individual projects remain unconnected, hence slowing down circular developments in the city.

- **Confusion and a wide range of interpretations on what the circular economy is, what the transition to a circular economy requires, and why it is relevant.**
  This lack in knowledge on the circular economy seems to be prevalent both within local governments, as well as amongst market parties and civil society.

- **The circular economy is often only regarded from a waste or environmental management perspective, instead of from a wider multi-sectoral economic development perspective.**
  The circular economy demands a paradigmatic change towards a new economic system with (nearly) zero waste that encompasses value chains in all sectors of the economy. This can only be achieved by a resource approach to the circular economy, not a waste management approach.

- **Circular projects require new and far-reaching levels of cooperation and coordination amongst all stakeholders involved. This is difficult to organise and maintain.**
  CE development generally requires cooperation between a wide range, both in number and type, of stakeholders. Aligning expectations, ambitions, and efforts is a task which often demands dedicated coordination and management. This is

especially relevant as most circular projects are innovations; what is the exact desired end state is thus unknown and requires a culture of experimentation and acceptance of failure.

- **Citizens awareness and participation is very low.**
  Insufficient citizen awareness is a major issue to urban circular developments. Deliberately created citizen engagement is scarce, and the social and behavioural aspects of the transition remain under-investigated. This consequently increases the risk that cities move to the circular economy with market parties and knowledge institutes but without properly including citizens in the process.

Better funding

- **There are insufficient funds available to support circular projects and programmes.**
  Not only because there is limited funding available, but also because there is limited knowledge on the sources and types of funding/financing that are available, on specific conditions attached for accessing them, and on how to use such funding/financing most effectively to foster the transition to the circular economy.

- **Private innovation power for circular companies can be insufficient.**
  The single largest cause for a deficiency in private innovation power is that markets for circular products and services are still underdeveloped.

Better regulation

- **City development strategies are currently often made in silos.**
  In many cities decision-making on urban development remains to take place in silos, while circular economy requires a more multi-dimensional and integrated way of administration.

- **The current tax system obstructs circular development.**
  A tax system that supports the CE predominantly requires a shift from high taxation of labour to taxation of (virgin/non-renewable) resources.

- **Current (waste) legislation hinders innovative reuse and/ or recycling of products and materials.**
  The legal status as 'waste' often hinders innovative reuse and/ or recycling of products and materials.

Good governance practises of aspiring circular cities

The research has not only allowed to identify barriers obstructing the transition towards a CE but also insightful information on what cities are doing to overcome such barriers. A list of good governance practices applied by such front runner cities is presented in the following (grouped for each of the three pillars of EU policy making and implementation):

Better knowledge

1. **Develop and communicate a long-term, holistic vision about the circular ambitions of the city**

This vision reflects the long-term circular ambitions of the city and should be supported and driven by the political leadership. It should reflect a notion of experimentation and learning by doing. Because without room for experimentation, failing and alteration of plans when needed, the circular economy cannot succeed.

2. **Introduce cross-thematic coordination and promote a culture of cooperation and knowledge exchange and creation within the own municipal organisation.**
   Trans-departmental cooperation as well as continuously driven innovation and coordination of circular economy efforts in the city are crucial. Without proper coordination, it is difficult to keep track of the larger city CE scenario and direct all of the initiatives in the right direction. Whatever form of coordination is pursued, a culture of learning by doing and investments in knowledge creation within the individual organisation are considered to be essential.

3. **Identify, address and include non-municipal stakeholders early on in the transition process (e.g. businesses, knowledge institutes, citizens) - in order to craft the process to come to circularity within an urban context, together.**
   This is predominantly based in the notion that the city alone cannot make the circular economy happen. The city is a partner in the urban transition to the circular economy, not the director. The transition is a co-creating process in which market parties, knowledge institutes and ideally also citizens have the lead; the city needs to facilitate the right conditions for innovations to take place.

4. **Analyse the urban metabolism (material and energy streams, bio-sources and sinks) as a basis for developing a strategic plan for the CE transition with contextualised priority sectors.**
   Mapping the urban flows of materials, energy, heat, water, bio-resources and waste to clarify what resources exist in the city (referred to as, among others, 'urban metabolism scan', 'city scan', 'urban flow analysis'). This information can be used to identify which urban sectors have the greatest potential for circular developments and where opportunities for circular innovations lie in the various value chains. This helps to start off innovations in the right direction from the very beginning.

5. **Educate consumers (and other stakeholders) in civil society and more in particular cities based on an inclusive and participatory approach. In order for the CE to thrive in an urban context, co-creation from the start with citizens is crucial.**
   It is crucial to increase citizen understanding of the rationale for a circular economy and how they can contribute. Citizens should not only be seen as consumers but also be involved and consulted in strategy development and implementation.

Better funding

6. **Use circular public procurement to create demand for circular innovations.**
   Shifting to circular public procurement and circular tenders is seen as one of the most effective administrative instruments that cities have to incentivise the development of markets for circular goods and services.

7. **Identify external sources of funding/financing for CE initiatives and projects available at EU and/or national level to complement the cities' own budgetary sources and get acquainted with their rules and procedures.**
   Several of the cities interviewed explained the merits of becoming familiar with the available EU and national funding sources for circular initiatives as a complementary source of funding. As in general cities have relied only on their own budgetary sources to fund investments they are often not aware of external sources of funding/financing and the specific rules and procedures.

Better regulation

8. **Facilitate appropriate spaces and funding for experimentation, (private) innovation, knowledge transfers and match-making in the field of CE for businesses, research institutions and interested citizens.**
   Within these experimentation zones, current rules and regulations are not (fully) applicable or complied with which allows for far-reaching experimentation and innovation.

9. **Create forums with like-minded cities at the national (and possibly also at EU) level to lobby for necessary changes in EU and national legislation that currently block the transition to a CE.**
   This is a prime example of an intervention that cities can implement to increase their influence on national authorities to remove regulatory barriers created by legislation established at the national (or regional) level.

10. **Continuous monitoring and evaluation of implementation of circular projects and initiatives, with the aim to develop a solid knowledge base and provide feedback to guide/adjust the transition process.**
    An important tool yet to be developed by cities is a system to measure, evaluate and learn from the efforts and progress made in the process towards urban circularity.

It is to be noted that given the lack of long-term records and a solid knowledge base, it is not possible to speak of *proven* strategies and/ or plans that could serve as a standard model for wider replication. Despite the limited empirical knowledge concerning the process and different stages of a transition to a circular city, it is useful to disseminate the experiences and lessons learned by the front runners (both from successes and failures), as a way to promote better knowledge and spur discussions and further research on the subject and also to serve as a source of orientation and guidance for other cities that are in or aim to engage in the same process. It is expected that the 'Circular City Portal'[3] included in the action plan of the UAPCE will further support the development of better knowledge and contribute to the creation of a rich knowledge base on this subject.

Alongside the research on the barriers and good governance practices in circular city transitions described above, the study also inventoried and reviewed documents providing

[3] *The Circular City Portal is conceived by the Partnership as a web-based tool that will (i) consolidate, compile and link to relevant information and resources freely available on the development of the circular economy in cities and (ii) promote the further development, dissemination and sharing of new information and know-how on the subject with a focus on practical implementation issues. Its main aim is to contribute to the creation of an openly shared knowledge basis that would inspire and guide cities in their journey towards a circular economy.*

standards, requirements or guidelines that could be used by cities to ensure that their strategies, organisations and processes are better fit for the transition towards a circular economy. These documents included:

(i) Documents providing guidance specifically on the transition to a circular economy, with particular focus on documents dedicated to cities (labelled as Circular City Guidance Reports (CCGR's));

(ii) Documents providing standards for businesses and organisations (and guidance on their implementation) on a variety of specific topics such as quality management (ISO 9000 family of standards), environmental management (ISO 14000 family of standards, EU Eco-Management and Audits Scheme - EMAS), social responsibility (ISO 26000), sustainable procurement (ISO 20400), stakeholder engagement (AA 1000), social accountability (SA 8000), sustainability reporting standards (GRI).

The review of CCGR's found only two reports that are specifically aimed at cities and their local authorities which were publicly available:

Circular Europe Network (2015) – CEN General Guidelines on Circular Economy Strategies by Local and Regional Authorities. This publication is not completely public but reserved to members of the CEN (http://www.circular-europe-network.eu/library/general-guidelines/).

- *This publication aims at explaining the potential role of local and regional authorities and helping them to draw up integrated and efficient circular economy plans. Even though acknowledging the broader concept, the guidelines focus mainly on materials considering that it is difficult for local and regional authorities to encompass all of the topics all at once and since material resources represent the core element of circular economy.*
- ESPON, Interact, Interreg & Urbact (2016) - Policy brief on the circular economy: Pathways to a circular economy in cities and regions (https://www.interregeurope.eu/fileadmin/user_upload/documents/Policy_brief_on_Circular_economy.pdf).
- *Based on concrete local and regional examples, ESPON, Interact, Interreg Europe, and URBACT have produced a policy brief outlining pathways to a circular economy in cities and regions. The project looked into the territorial potentials for a greener economy as the territorial dimension of a region was concluded to be an important factor in the transition process.*

The other CE guidance documents reviewed were either of generic nature with no specific target group, or aimed at businesses (in general or in specific sectors), or at other levels of government (national governments), for example:

- De Groene Zaak & WBSDC (2015) - Governments going circular - A global scan by De Groene Zaak (Dutch Sustainable Business Association). *This publication comments on the best practices found and provides ideas for circular transition for national governments.*
- EEAC (2017) - Europe Goes Circular. *This document provides an analysis on whether and how Europe is moving to a circular economy by examining the situation in countries and regions in which an EEAC member council is located.*

- Ellen MacArthur Foundation & BAM (2017) - Circular Business Models for the Built Environment. *This publication explores the benefits that circular business models (CBMs) offer stakeholders within the built environment sector. The report proposes a shift in the way the construction value chain has been historically seen.*

More generally speaking, almost all of the CCGR's, independent of their focus or target group, provided guidance on circular city strategy but no concrete tools or examples revealing how to put this strategic advice into practice. This further strengthens the case for the UAPCE Action Plan in which a publically available 'Circular City Portal' is suggested, providing hands-on, practical examples and tools that can be used by cities to support their implementation of circular city governance interventions.

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1 Introduction

1.1 Background and objective for the study

Cities are attractive starting points for making the transition to a circular economy. Considering this observation and in the context of the EU Urban Agenda, the Partnership on Circular Economy (henceforth, UAPCE) in which the EIB is actively participating together with other stakeholders is investigating ways and means to promote the transition to a circular economy in European cities.

The Urban Agenda for the EU focuses specifically on three pillars of EU policy making and implementation: better knowledge, better regulation, and better funding. The overall objective of the UAPCE is to identify, analyse, and recommend concrete actions in these three key dimensions to help cities expedite this transition:

1. Better regulation: focus on more effective and coherent implementation of existing EU policies, legislation and instruments.
2. Better funding: identification, support, integration, and improvement of traditional, innovative, and user-friendly sources of funding for urban areas at the relevant institutional level including from European structural and investment funds (ESIF) (in accordance with the legal and institutional structures that are already established) with the aim of achieving effective implementation of interventions in Urban Areas.
3. Better knowledge (base and knowledge exchange): enhance the knowledge base on urban issues and the exchange of best practices and knowledge.

For this purpose, the UAPCE has been working with a set of selected priority themes to accomplish the following tasks (with the originally proposed time plan in brackets):

1. Stocktaking phase (March 2017 – September 2017): identify and analyse the specific barriers and obstacles for introducing and developing the circular economy in cities as well as existing good practices in the three key dimensions (better regulation, better funding, better knowledge) and, on that basis, identify a limited set that can be transformed into concrete actions.
2. Preparatory phase (April 2017 – December 2017): building on the results of the stocktaking phase, a limited set of actions shall be selected and analysed that support the incorporation of the circular economy in cities through better regulation, better funding, and better knowledge. The selected actions must respect the principles of subsidiarity and proportionality.
3. Definition phase (August 2017 – September 2018): after consultation and discussion within the CE Partnership and with interested external experts and organisations, the selected actions shall be compiled into a comprehensive Action Plan with clear objectives and deliverables, a guideline for action implementation, and pertinent indicators and targets where appropriate.
4. Implementation phase (October 2018 – December 2019): The Action Plan will be implemented and its results subsequently analysed.

The CE Partnership defined the following four priority themes on which to concentrate its work: three vertical themes on (i) “Circular business enablers and drivers”, (ii) “Circular consumption”, (iii) “Urban resources management”, and one horizontal theme on (iv) “Circular City Governance”. For each priority theme, a working group was established to conduct the above mentioned tasks as part of a collaborative effort. The working group members are interested members of the CE Partnership.

The EIB has been involved in a leading role in the working group dedicated to the “Circular City Governance” theme. The “Circular City Governance” theme, which has been identified as being crucial to the further development of the circular economy, will focus on the common issues, barriers, and drivers that can be found across all the other (vertical) themes with a view to address the wider question of what 'conditions' are required to ensure that circular economy thinking becomes the norm in cities and how collaborative governance could support circular city developments.

This report presents the results of an empirical research study conducted by a team led by Prof. Jan Jonker of Radboud University Nijmegen (hereafter referred to as the research team) as part of an assignment commissioned by the EIB to support its work and that of its partners in the working group on the “Circular City Governance” theme.

1.2 Scope of the study and expected outcomes

The specific activities covered by the research team under the mentioned assignment are governed by the Terms of Reference (ToR) that were stipulated by the EIB and agreed upon with the service provider on the basis of mutual consent at the beginning of the assignment. The full ToR can be found in Appendix 1 - Terms of Reference.

The work plan for the assignment as defined in the ToR consisted of the same distinct phases as the overall work plan of the UAPCE (see previous section): a stocktaking, preparatory, and definition phase followed by a phase for preparation for implementation.

The research team’s work on the activities defined for the stocktaking phase began in mid-October 2017 after the signing of the contract for the assignment and continued until mid-December 2017. While the research team’s work on the activities in the stocktaking phase was progressing, the EIB assignment managers and the Consultant agreed to certain changes in the methodological approach envisaged by the ToR. It was also recognized that certain activities stipulated in the ToR, particularly for the subsequent phases of the assignment, had become less relevant for the research team to focus on. It was, therefore, agreed between both parties to review the scope of activities that were stated in the original ToR and introduce new activities that were considered of greater value for the work of the EIB and the UAPCE (to replace those that had been previously agreed on). To formalize this agreement, an addendum to the original ToR was drafted that specified the revised scope of activities for the preparatory and two subsequent phases of the assignment. The addendum is presented in Appendix 2 - Addendum to the Terms of Reference.

The following is a summary of the original scope of activities that were foreseen for the stocktaking and preparatory phases according to the ToR for the assignment followed by the modifications included in the addendum to it.

Below is a summary of activities according to the original ToR (shortened version, see Appendix 1 for the complete version):

1. During the stocktaking phase: support the work already initiated by the working group on Circular City Governance including the following tasks/activities:
    - Conceptualisation and description of the circular economy potentials in a city context with the help of appropriate mapping tools;
    - Identification and description of common barriers and obstacles to the introduction and development of a circular economy in different cities;
    - Explanation of how these barriers and obstacles are caused by a lack of governance action and at what level this should be addressed;
    - Identification and description of selected case studies of cities that illustrate good practices for different ways of overcoming initial barriers/obstacles and promote circular developments;
    - Establish of a long list of barriers and obstacles to be used as a basis for identifying a short list of key governance actions that would support the development of a circular economy in cities through better regulation, better financing, and/or better knowledge.

2. In the Preparatory phase: support the work to be performed by the working group on "Circular City Governance" including the following tasks/activities:
    - Selection, with the involvement of the members of the CE Partnership, of a short list of concrete governance actions that are deemed most appropriate for supporting the development of a circular economy in cities through better regulation, better funding, and better knowledge;
    - Description and analysis of the short-listed actions;
    - Compilation of analysed actions into a Draft Action Plan for Improving Circular City Governance.

As per the later addendum to the ToR (see Appendix 2 - Addendum to the Terms of Reference), the activities of the preparatory phase were replaced with the following activities:

- A review of generic guides for circular cities and other publicly available documents authored by cities including strategies, plans, and guidelines to foster the circular economy in their own urban context. These documents are based on various interpretations of the notion of 'circularity', follow different approaches, and use a variety of concepts, definitions, and formats. They have in common that they are written in a specific (national, local) context that assists cities in crafting and guiding their own pathway towards circularity;
- Carry out a limited number of interviews with representatives of European cities that are currently engaged in the design and implementation of strategies for the development of the CE in their constituencies to identify governance actions undertaken and common barriers and obstacles faced in the process.

1.3 Content and structure of the report

This report provides a summary of the results of the research activities conducted in the two initial phases of the assignment as described above (stocktaking and preparatory phases, as per ToR and modifications included in the addendum). The activities under Phases 3 and 4 of the assignment are not included in this report and will be part of separate deliverables (see revised scope in the addendum in Appendix 2 - Addendum to the Terms of Reference).

The primary outcomes of the research study presented in this report as presented in Chapter 3 address the barriers and challenges encountered by cities that are seeking to promote the circular economy and governance interventions and actions that cities can take to facilitate the transition to a circular city. The focus is placed on barriers that are experienced at the local level and governance interventions that can be implemented by cities themselves and not on barriers and subsequent interventions that require interventions at the national and EU level.

As main sources of information, the research team used circular project case studies in urban environments, circular economy strategies, and plans elaborated by cities and interviews with experts and city officials. They provide practical experiences from cities and urban projects that have already engaged in the transition to a circular economy in some form or another. The methods used to gather and analyse these cases are presented in Chapter 2. The overview of presented barriers and challenges are not to be considered as conclusive nor is the list of main interventions and actions concretised. Each city has a distinct urban context (shaped by regulations, experiences, historic settings, etc.), different interventions that work well in a specific context, and different barriers that emerge. Nevertheless, the information provided in this report can function as a source of inspiration and guidance for cities (and regions) that are in need of practical assistance in the process of a transition towards a circular economy.

In addition to the analysis of barriers and possible governance interventions that represent the main focus of this report, two additional activities were conducted. The first is an analysis of available scientific literature and generic guidance sources on circular city transitions which are presented in Section 3.4.1. The second activity produced a concise inventory of mostly generic quality management frameworks that can be applied in the context of developing guidelines for the circular economy. The results of these activities are presented in Section 3.4.2.

The report concludes with Chapter 4 in which insights are provided into the current status of and approaches to the circular economy by cities already engaged in the transition, the primary lessons learned, and the main obstacles that were encountered. In conclusion, a set of recommendations is provided which aim to support the UAPCE in the definition and subsequent implementation of its action plan (see Subsection 4.4.).

2 Data collection and analysis

The study is based on a variety of research activities that were conducted following an empirical approach based purely on qualitative data analysis. Below, these activities are defined and elaborated on through clarification of the sources and different methods used to analyse these sources. A description of the key-terminology that is utilized and related to the various research steps is provided as well.

2.1 Sources of information

The research is predominantly based on information gathered from two different types of sources: (i) documents showcasing project case studies (see Section 2.1.1) and (ii) direct interviews with selected experts and city officials (see Section 2.1.2).

2.1.1 Project case studies

The research included the collection and examination of documents describing project case studies that were made available by members of the UAPCE or obtained through internet research and thus publicly accessible. In the case of the documents obtained from the public domain (internet), only documents written in the English language were collected and analysed. These are described below in Section 2.1.1.1 and Section 2.1.1.2, respectively.

Case studies described projects of which the focus was the **urban circular economy**, and there was involvement from the **local government** in different aspects (as a promoter, sponsor, funder, coordinator, etc.). These two concepts are clarified in the following information.

Urban circular economy applies to all of those (combined) economic activities that are implemented by public and private actors in an urban context with the aim of increasing resource efficiency and reducing waste generation by (i) designing and producing products and assets for longevity and zero waste, (ii) promoting the sharing of products and assets amongst various users, and (iii) keeping urban resource streams (e.g., materials, energy, water, etc.) in closed loops and at their highest possible value throughout a product's or asset's life-cycle.

Local governments generally act within the powers delegated to them by legislation or directives of the higher level of government. These may vary from country to country, however, it is common to be able to identify the following primary functions: (1) urban and space planning; (2) provision of (social) housing; (3) local mobility systems/transport infrastructure; and (4) municipal utility systems and services (energy and heat supply, water supply, waste management, etc.), (5) promotion of recreational activities and tourism; (6) protection of the local environment (including city ornate), (7) local business promotion (including services and industry), and (9) provision of social services (including, amongst others, health and education). These functions are managed by two distinctive groups: (i) political leadership generally elected by popular vote for a limited period of time and supported by (ii) the local administration body with permanently dedicated management and administration staff generally organised in departments/divisions that are defined based on the primary functions mentioned above and secondary supporting functions (legal, ICT,

asset management, etc.). For managing increasingly complex processes, the administration makes use of modern (and increasingly intelligent) information and communication technology (ICT).

The analysis of the documents was performed following a specific analytical format which allowed for systematic analysis of the aggregated data. The full format can be found in Appendix 3 - Analysis format. For clarification purposes, the most important elements of the analytical format are described below:

Categories of circular strategies pursued

One of the key indicators of circularity is the implementation of one or more circular strategies. Various sources of literature[4] on the circular economy mention a series of basic strategies aimed at maintaining and optimising the economic value of resources used as much as possible in an economy. These include the following:

> 7 R's: *(1) reduce (in the sense of reducing or abstaining from certain types of consumption), (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up- & downcycling)*

This classification of circular strategies has been applied to describe the different types of circular projects/initiatives that were analysed as part of this assignment. Note that most of the 7 R's or "re-strategies" mentioned above mainly occur at the post-consumption stage of the product life-cycle when products cease to be used and are discarded.

The conducted research has focussed principally on analysing cities that are pursuing circular economy strategies that are more comprehensive and clearly go beyond material and waste recycling. Such cities are expected to be fewer in number and face many more barriers and obstacles for implementing their circular strategies than cities focussing solely on waste recycling strategies.

Categories of circular business models pursued

One of the indicators of circularity is the adoption of circular business models of which a variety already exists. In this research, the following were considered:

> (1) Product-as-a-service models. Producers do not sell products but, instead, sell services; the products themselves are used by consumers through lease or pay-for-use arrangements. This encourages product durability and provides incentives for repairing.
> (2) Platform/sharing models. Enables increased utilization rates and optimises functionality by shared use, access, and/or ownership of products
> (3) Reverse logistics model. This is the process of collecting or moving assets/ materials from their final point of use with the purpose of either life-cycle prolongation of the products as a whole or their separate parts or disposal of the product.
> (4) Value-cascading model. Constructing a revenue model with various constituents.

[4] Adapted from ACR+ and the European Commission report Moving Towards the Circular Economy

(5) Industrial symbiosis model. An association between two or more industrial facilities or companies in which the wastes or by-products of one become the raw materials for another.

Categories of barriers and obstacles encountered

When implementing circular projects or city programmes, cities can encounter a variety of obstacles and barriers. According to the UAPCE, these obstacles can be related to:

(a) Lack of *funding*. Circular initiatives can be obstructed by insufficient availability of funds and/ or inaccessibility of funds.
(b) Lack of appropriate *legislation*. Current legislation is insufficiently supportive and often obstructing towards circular projects.
(c) Lack of *knowledge* with one or more of the stakeholders. This can lead to underappreciation of the necessity of the transition to a circular economy, ambiguousness in understanding what the circular economy is and entails as well as what must be done to achieve it.

Categories of governance interventions applied by cities

Cities have a wide range of tools available that they can apply to support urban circular projects and/or city-wide transition initiatives. According to the UAPCE, these interventions can be related to:

(a) Policy/strategy
(b) Regulation/incentives
(c) Monitoring and enforcement
(d) Funding/financing
(e) Tariff collection/taxation
(f) Data/knowledge management
(g) Public awareness building and education

Scalability and replicability

Two additional items that were included in the analysis were scalability and replicability. These are defined as:

Scalability: to what extent is it possible to expand the case or to implement the case on a larger scale?
Replicability: to what extent is the case transferable to other city 'situations'/environments?

Impact

The last item from the format that requires clarification is 'impact'. In this research, 'impact' is defined as the effect of a project on specific indicators. Examples could be the amount of CO2 that is reduced, the total reduction of water use or waste that is achieved, the reduction of the number of kilometres in city-transport, the number of people impacted by the case, and many other indicators.

As indicated in the above, two sets of cases were analysed by utilizing document analysis following the format introduced above and fully shown in Appendix 3 - Analysis format. Both sets of cases are described below.

2.1.1.1 Case studies provided by members of the UAPCE

The first set of cases that were the object of analysis were fifteen project case studies provided by members of the Urban Agenda Partnership on Circular Economy:

1. Stadslab 2050, Antwerp, Belgium (http://stadslab2050.be/)
2. Led-light, Kortrijk, Belgium (http://vlaanderen-circulair.be/)
3. Buda+, Vilvoorde, Belgium (www.vilvoorde.be)
4. Poort Genk, Genk, Hasselt, and Houthalen-Helchteren, Belgium (http://buur.be/project-item/circulaire-economie-poort-genk/)
5. Circular bio-resources, Oslo, Norway (no site)
6. Mini-reuse and -recycling, Oslo, Norway (no site)
7. Retuna, Eskiltuna, Sweden (https://www.retuna.se/sidor/in-english/)
8. Lube oils, Endiale, Greece (http://www.endiale.gr/index.php/arxiki)
9. Bike sharing, Moschato, Greece (no site)
10. Hellenic Cement Industry Association (HCIA), unknown, Greece (no site)
11. Olive oil mills, unknown, Greece (no site)
12. Wcycle, Maribor, Slovenia (https://skupnostobcin.si/projekt-wcycle-maribor.pdf)
13. Bee path, Ljubljana, Slovenia (http://urbact.eu/bee-path)
14. Green chains, Ljubljana, Slovenia (www.tourism4development2017.org)
15. Knotweed, Ljubljana, Slovenia (eurocities.eu/Lujubljana_Circular)

Six of the cases indicated having circular economy development ambitions beyond a recycling (waste management) strategy. These were Stadslab 2050 (Antwerp, Belgium), LED-light (Kortrijk, Belgium), Buda+ (Vilvoorde, Belgium), Poort Genk (Genk, Hasselt, Houthalen-Helchteren, Belgium), Retuna (Eskiltuna, Sweden), and mini-reuse (Oslo, Norway). Six other projects were aimed at only recycling (Circular bio-resources, Oslo, Norway; Lube oils, Endiale, Greece; HCIA, Greece; Olive oil mills, Greece; Wcycle, Maribor, Slovenia; Knotweed; Ljubljana, Slovenia). The three remaining cases (Bike sharing - Greece, Moschato; Bee Path - Slovenia, Ljubljana; and Green Chains - Slovenia, Ljubljana) appeared to not be actual CE projects but displayed more general sustainable development projects (particularly in the areas of tourism and rural development) with less focus on circularity.

For the individual analysis results of the 15 cases of the UAPCE, see Appendix 4 - Analysis fifteen UAPCE cases. In the next chapter, a synthesis is provided of the outcomes of all of the sets of case studies combined.

2.1.1.2 Cases identified through internet research

To secure a sufficiently large information basis for the final analysis, it was decided to expand the set of 15 UAPCE cases with case-studies from across Europe that were available on various websites on the Internet. Extensive Internet research was conducted that resulted in the establishment of a database with a total of 337 cases on sustainable and circular city developments (see Appendix 5 - Internet case database for the full database). While collecting these cases (and including the cases provided by the partners in the 'Urban Agenda for the EU'), it became increasingly evident that, across Europe, the terms 'sustainable' and 'circular' or 'circularity' are used with a variety of connotations and often in an interchangeable manner. Cases that are labelled as 'circular' but, in fact, address aspects

of sustainability were also registered in the initial cases-collecting stage of this research. Eventually, however, a large majority of cases were determined to be more related to sustainification than to circularity.

After collecting and identifying 337 cases (N = 337), N = 38 were selected as having the greatest potential of being an actual circular case specifically addressing the enhancement of circularity within an urban environment and were analysed following the format shown in Appendix 3 - Analysis format. However, as the document analysis often provided incomplete and, therefore, insufficient or unverifiable information, for many of these cases, additional mails were sent and calls were made with the aim of gaining additional information and subsequently increasing the understanding of the cases under consideration. The format was used to structure the gathering of information. Even after this additional effort, it was still not possible to identify relevant barriers and interventions for several cases. For others, it appeared as though they were not suitable for analysis as they were not driven by the intention to create circularity or because there appeared to be no interventions driven by cities. Thus, eventually, only ten cases (N = 10) were included in the final analysis.

1. Austria - Vienna - Baukarusell (http://www.repanet.at/baukarussell/)
2. Belgium - Gent - De Nieuwe Dokken (http://www.leefmilieu.brussels)
3. Denmark - Copenhagen - Get your city carbon neutral (https://stateofgreen.com/copenhagen-carbon-neutral-by-2025)
4. France - Paris - La Carte Main Verte (https://api-site-cdn.paris.fr/images/123236.pdf)
5. France - Paris - Le Metropole Du Grand Paris (http://www.metropolegrandparis.fr)
6. Iceland - Reykjavik - Better Reykjavik (https://www.citizens.is/better_reykjavik/)
7. Ireland - Dublin - Rediscovery centre (http://www.rediscoverycentre.ie/)
8. The Netherlands - Amsterdam -Buiksloterham (https://buiksloterham.nl/)
9. Sweden - Linkoping - Biogas plant (https://www.tekniskaverken.se/in-english/)
10. UK- London - BEDZED (https://www.bioregional.com/bedzed/)

The next chapter provides a synthesis of the analysis of the various sets of case studies. For the separate outcomes of each of the cases, see Appendix 6 - Analysis ten selected cases from the database. In Appendix 7 - Identified barriers and interventions database cases, an overview is provided of all of the individual barriers and individual interventions that were identified within these ten cases.

2.1.2 Interviews

Contradicting initial expectations, the case study analysis based on publicly available (online) documentation did not provide sufficient information to draw solid conclusions for this research. Therefore, to deepen the understanding of governance interventions undertaken and barriers encountered in already initiated circular city cases, it was decided that the best option considering the available time and resources was to conduct a limited set of interviews with representatives of cities in circular transition or representatives of urban circular projects. The interviewees were identified through a combined action of personal networks of the researchers, contacts provided by EIB, and partners of the UAPCE.

Eventually, thirteen interviews (and two test-interviews) were conducted with City or Urban Circular Project representatives (with the exception of one interview that was with the CEO of the Slovenian circle economy knowledge institute, Circular Change - who often works with cities). The respondents were from Belgium, Finland, France, Germany, Italy, the Netherlands, and Slovenia (for a detailed list of interviewees, see Appendix 8 - Interviews). The interviews are all based on the same interview protocol. For the last two interviews with the Flemish cities of Antwerp and Roeselare, the script was altered slightly in order to be able to gain additional knowledge on aspects related to the funding of CE initiatives in particular. The respondents were promised anonymity, therefore, names are not included in the transcripts. For both of the interview scripts that were used, see Appendix 9 - Interview scripts. A synthesis of all of the individual interviews can be found in Appendix 10 - Interview synthesis. Appendix 11 - Identified barriers and interventions interviews provides an overview of all of the individual barriers and individual interventions that were deduced from the interviews.

2.2 Additional document research

In addition to the case study analysis, three additional research activities were conducted to further expand the knowledge base on circular city governance:

1. The first additional research step regarded the analysis of publicly available literature on circular city governance. The results are provided in the next chapter. A brief summary and synthesis of the key findings relevant to this activity is located in Appendix 12 - Generic guidance documents.
2. The next step was aimed at identifying potential quality management frameworks for the circular economy. The outcomes and advice for further research and potential use of these frameworks can be found in the results chapter (Section 3.4.2.).
3. The final research activity was aimed at identifying publicly available circular city development strategies, roadmaps, and plans to identify best practice amongst cities that are more advanced. An overview of the documents that were found is shown in Appendix 13 - Overview of City Development Roadmaps. These reports have also been analysed regarding their content. The results of this analysis are presented and discussed in a separate brief (see addendum to the ToR in Appendix 2 - Addendum to the Terms of Reference).

3 Research outcomes - Obstacles and opportunities for circular cities

In the previous chapter, the various sets of case studies and other documentation that were gathered and analysed have been described. In this chapter, a synthesis of the results of the analyses of these project case studies, city strategies/plans, and expert interviews are presented.

Section 3.1 elucidates the current status of circular developments of cities in Europe. Section 3.2 describes the common obstacles and barriers that cities have experienced when engaging in the development of the urban circular economy. Section 3.3 discusses the governance interventions and strategic actions that cities have shown to take in order to foster the transition to the circular economy within their borders. For both analyses, the division in *better knowledge, better funding,* and *better regulation* is followed to align with the work of the UAPCE. The final section, i.e., Section 3.4, provides the outcomes of the additional research tasks that were executed as described in the previous chapter (Section 2.2.).

3.1 State of play of the CE in the urban environment

In order to frame and assess the results of the research presented in this work, it was deemed appropriate to briefly outline the status regarding the Circular Economy in Europe. An overall outcome is the observation that, across Europe, there are still very few cities involved in the circular economy. This is demonstrated by the difficulties encountered in finding appropriate CE project case studies implemented in or with the involvement of cities despite the rather comprehensive desk-research conducted to identify those cases. Although many case studies may possibly have been missed due to the fact that the research was conducted exclusively in English, in general, it can be concluded that the amount of effort it takes to find cases reflects the modest availability of those that are actually appropriate. Hence, the insights gathered and presented in the remainder of the report reflect the experiences of mainly front-runner cities. Even for those cities, it should be noted that most of them have limited experience with implementing the transition process to a circular city and have just begun experimenting with pilot initiatives. Only very few examples exist of cities, such as Amsterdam, that are more advanced in implementing the transition towards the CE. As a consequence, the results in the next two sections should be read as providing insight into the most common barriers and the best practices of governance interventions for cities that are just *starting* with the development of a circular economy in the urban environment.

3.2 Common obstacles and barriers for cities seeking to promote the circular economy

Based on the case study analysis, the following common obstacles and barriers were identified within the various domains. These outcomes are a synthesis of the obstacles and

barriers that were identified in the three separate data sources used in this report (the UAPCE cases, the database cases, and the interviews). As already stipulated, each city has a distinct urban context which means that not all of the barriers identified here will apply to every city. Neither is this an exhaustive list of all of the barriers that might occur. Nevertheless, the results that are presented reflect some of the common obstacles that seem to be relevant to consider for any city aiming to initiate the transition to a circular city. When relevant, the barrier that is presented is linked to the related Action Point as put forward in the *(Draft) Action Plan of the Urban Agenda for the EU (in press)* that was composed by the Partnership. The relationship between the barrier and the UA Action Point is shown in the coloured boxes.

Better knowledge

By far, the largest share of identified obstacles is related to the knowledge domain. In fact, lack of knowledge about the circular economy, both inside and outside the local government, appears to be one of the most critical barriers obstructing the transition to circular cities. The list below presents the overview of identified common barriers related to the *better knowledge* domain (the list is non-hierarchical):

Insufficient or lacking political support is a major barrier to circular economy developments

One of the most crucial factors enabling the transition to a circular economy is support for long-term circular ambitions at the appropriate institutional levels. Without reinforcement and active support at the political level, circular developments will remain to be non-integrated and inefficient, making it very difficult to interconnect the various circular developments in the city. Even if motivated administrative staff is engaging in circular economy developments, political support is paramount for moving beyond the facilitation of individual projects and enabling a transition to a circular economy. Moreover, lack of political support and dedicated ambitions provides little confidence for private businesses to move towards more circularity.

Confusion and a wide range of interpretations on what the circular economy is, what the transition to a circular economy requires, and why it is relevant.

This lack in knowledge on the circular economy appears to be prevalent both within local governments and market parties. Within the local government, experience shows that this lack of knowledge causes reluctance and resistance amongst staff, especially when they do not see the benefits or necessity of changing their routines and procedures. Moreover, minimal knowledge of what is required for the transition to a circular city also means there is often insufficient understanding on what capabilities are required (and which ones are already available or not) within their own organisation.

Relatedly, there is significant variety in maturity levels amongst the stakeholders who are involved in the transition to the circular economy. Such differences in knowledge on and ambition towards the circular economy can be problematic as the circular economy demands participation and cooperation between various stakeholders even when their expectations and ambitions are not aligned.

Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. "A Circular City Portal (...) (i) Serves as a central point of access to information dedicated to the promotion of the circular economy in cities that is freely available from various sources including institutional web-sites and platforms in the public space, thus allowing interested cities and other stakeholders an easier and quicker access and navigation to the relevant information and tools they need; and (ii) Promotes the further development, dissemination and sharing of new bespoke information, tools and know-how by and between cities with the aim to contribute to the creation of an openly shared knowledge basis that would inspire and guide cities in their journey towards a circular economy." This can be of great value to decrease the level of uncertainty and ignorance about the circular economy as experienced by city practitioners of the front runner cities."

The circular economy is often only regarded from a waste or environmental management perspective instead of from a wider multi-sectoral economic development perspective

Because of the lack in understanding of the circular economy, it is often approached from a waste or environmental management perspective rather than a wider economic development perspective. This is also reflected in the allocation of the responsibility for the circular economy agenda within city administrations which are often managed by the waste management or environmental departments. This may have practical reasons (e.g., related to the existence of knowledge of technical systems and environmental problems), however, may also be problematic in the long term as, eventually, the aim of the circular economy is a paradigmatic change towards a new economic system with (nearly) zero waste that encompasses value chains in all sectors of the economy. This can only be achieved by a change of focus from "waste" to "resources" and a better understanding of their flow throughout the economic value chains in different sectors. If the circular economy is approached from a waste management perspective, the risk exists that an end-of-the pipe position prevails in the finding of solutions, possibly leading to an optimised linear economic system with less waste but not to the required (technological and business model) innovations that are required to facilitate the transition to a circular economy.

Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. The blueprint "shall (...) include the following (but not limited to) preliminary list of topics identified by the Partnership: (1) Development of ***circular economy strategies and roadmaps, circular business models and value chains*** *(i.e. for food and bio-wastes, for building and construction materials/wastes, etc.) with mapping of key success factors, obstacles/barriers for implementation and mitigating actions; (...)".*
Providing publicly available information on how to approach the circular economy from a value chain perspective can help to increase the ability of cities to understand how to move to a circular economy that begins from a holistic instead of waste management perspective.

Circular projects require new levels of cooperation and coordination amongst all stakeholders involved. This is difficult to organise.

Circular economy development generally requires cooperation between a variety of stakeholders who can be partners within an economic value chain but could also well be organisations that were never required to previously cooperate. Aligning expectations, ambitions, and efforts is a task which often demands dedicated coordination; a driving force that keeps the participants headed in the same direction. This is especially relevant as most circular projects are innovations; what is the exact desired end state is thus unknown and requires a culture of experimentation and accepting the fact that failures in the process of transition towards more circularity can and will be made. Increased levels of coordination are not only relevant for specific projects but especially also within municipal organisations. Additionally, within the boundaries of the city hall, multi-sectoral cooperation is crucial for circular developments. However, especially since many cities are currently still very much organised in silos, this intra-organisational coordination requires substantial time and effort to overcome.

Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. The blueprint "shall (...) include the following (but not limited to) preliminary list of topics identified by the Partnership: (...) (2) Strategic governance options/tools/levers of change focusing on policy/strategy development, spatial planning, ***multi-stakeholder coordination/cooperation processes****, permitting/ licensing, economic incentives/disincentives, public awareness and education; (3)* ***Stakeholder mapping and analysis tools****". Both items 2 and 3 are very relevant, i.e., the latter to assist cities for identifying relevant stakeholders in the first place and the former to assist cities in understanding how to better coordinate them.*

Citizens awareness and participation is very low

Insufficient citizen awareness is a major issue to urban circular developments. Not only does this mean that there is only moderate enthusiasm from citizens for and participation in the circular economy, it also means there is little consumer demand for circular products and services which obstructs private innovation as well. Deliberately creating citizen engagement, preferably in the preparatory phase of the transition, seems to be a crucial yet often forgotten intervention that cities have at their disposal. This social and behavioural aspects of the transition remain under-investigated, and this consequently increases the risk that cities move to the circular economy with market parties and knowledge institutes but without properly including citizens in the process.

Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. The blueprint "shall (...) include the following (but not limited to) preliminary list of topics identified by the Partnership: (...) (9) Social (behavioural) side of a transition towards the circular economy (i.e., how citizens will be involved in the transition process, how to communicate and reach out to the citizens)." This is seen as a particularly important action point. In contrast to how often citizen awareness and participation was mentioned as a barrier, ideas on how to include civil society and make the transition to the circular economy a multi-lateral process were scarce. This social and behavioural side of the transition remains to be under-investigated and this increases the risk that cities move to the circular economy with market parties and knowledge institutes but without properly including citizens in the process.

In addition, Action Point 2.3.3. Promote Urban Resource Centres for waste prevention, reuse, and recycling is argued to be a relevant tool to spur citizen involvement. As already suggested in the UA Action Plan, these centres can be used as physical locations where citizens can learn, co-create, and share ideas about the circular economy.

Better funding

There are insufficient funds available to support circular projects and programmes

Acquiring sufficient funding for circular projects and necessary competencies (such as skilled staff) is one of the key issues that cities encounter. This is not only because there is limited funding available but also because there is limited knowledge on the sources and types of funding/financing that are available, on specific conditions attached for accessing them, and on how to use such funding/financing most effectively to foster the transition to the circular economy. Relatedly, there are cities that possess funds that are available for innovative or even circular *projects*. However, circular innovations often derive from start-ups and small companies that are tackling circular innovations with their entire business. However, these organisations cannot apply for project funding as they do not work on dedicated circular projects but facilitate circularity through their business model. Hence, they require funding as an organisation and not for specific projects.

Action Point 2.2.1. regards the development of a Circular City Funding Guide: "This guide is intended to help cities identify and access suitable sources of funding and financing for their own circular projects as well as for projects promoted by private and public entities in their territories. The guide will also build knowledge on how to design and set up effective funding schemes for circular city projects, taking into consideration their varying types, sizes and risk profiles." Hence, this could be a very relevant support tool for cities experiencing the funding issues described above.

Private innovation power for circular companies can be insufficient

The single largest cause for a deficiency in private innovation power is that markets for circular products and services are currently still underdeveloped. Very often, virgin materials remain less expensive, or there is not yet a demand for innovative circular products and services.

One of the key actions cities can undertake to create demand for circular innovations is through procurement (further explained in the next Section 3.3). Action Point 2.3.1. Prepare a Blueprint for a Circular City Portal can be of use to cities that aim to pursue circular procurement, as the Blueprint aims to "include the following (but not limited to) preliminary list of topics identified by the Partnership: (...) (6) Circular procurement guidelines".

Better regulation

As outlined in the introduction of the report, the focus of the conducted research lies on obstacles and interventions that can be addressed at the local level. However, two key barriers related to better regulation can, to a large extent, only be influenced at national or even European levels. Nevertheless, these barriers came to the surface during the case study analysis so frequently that it is worthwhile to mention them as cities experience both items as key obstacles to the transition of the circular economy. These barriers are:

The current tax system (predominantly related to the need to shift from high taxation of labour to taxation of (non-renewable) resources)

Obstructing (waste) legislation (the legal status as 'waste' often hinders innovative reuse and/ or recycling of products and materials).

The only practical solution for addressing such regulatory barriers were provided by Amsterdam which was the initiator of the so-called Circular City Deal, a forum in which various Dutch cities meet with national government ministries and business representatives to discuss and propose possible solutions for amending legislation and removing regulatory barriers for the development of the CE (https://www.iamsterdam.com/en/city-deal-puts-amsterdam-at-forefront-of-circular-economy).

Both barriers are addressed by the UA Action Plan. Action Point 2.1.3 Explore how economic incentives can support the circular economy in cities mentions "the potential of a coordinated system of taxation". Based on the barrier as provided above, it is recommended to further research this Action Point and work towards suggestions for such an alternative framework in order to answer to the tax barriers as experienced by cities.

Action Point 2.1.1. Help make waste legislation support the circular economy in cities can contribute to lifting this key regulatory barrier of obstructing waste legislation as experienced by cities by providing an alternative framework: "(...) a proposal for setting up a regulatory framework that better fits the requirements of using secondary resources in the context of a circular economy".

Two other barriers related to *better regulation* that can be addressed at the local level are the following:

City development strategies are currently often made in silos
Circular economy thinking has, in many cases, not yet permeated existing development strategies. Hence, in many cities, decision-making on urban development remains to take place in silos. Strategies for heat, waste, water, energy, and materials are all regarded separately without alignment, let alone integration of developments. The circular economy requires a more multi-dimensional and integrated way of urban development decision-making.

No Action Point from the UA Action Plan addresses this topic directly. Hence, it is argued to include this, possibly as a part of the Circular City Portal (Action Point 2.3.1.). This could take the form of a guidance tool for or simply examples of the various options that cities have for addressing the mismatch between the administrative silo-structure versus the requirements for holistic decision-making.

3.3 Governance interventions and strategic actions undertaken by frontrunner cities

The outcomes presented above are a synthesis of the interventions identified in the three separate data sources (the UAPCE cases, the database cases, and the interviews). Similar to the barriers that are identified, not all of the interventions that are conveyed here will apply to every city. Yet, again, the results do seem to reflect key strategic interventions that are relevant for any city intending to initiate the transition to a circular city.

The interventions as listed below are generic strategies. For the purpose of inspiration and support for cities that aim to move to a circular economy and implement these interventions but are uncertain how, each advice is concluded with a text box in which examples are provided of how the cities from the case studies have implemented the interventions.

Better knowledge
Develop and communicate a long-term, holistic vision about the circular ambitions of the city
This vision reflects the long-term circular ambitions of the city and should be politically supported and politically constructed. It is argued that it is best not to be set in stone but to reflect a concept of experimentation and learning by doing because, without opportunities for experimentation, failing, and alteration of plans when required, the circular economy cannot succeed. Relatedly, it is contended that it is best if this long-term vision does not include quantified targets (at least at this stage) but only qualitative targets, especially since no fitting indicators for circular economy efforts exist yet. The vision for a circular economy can be the starting point from which a transition agenda or detailed plans can be constructed. This agenda is similar to the vision, best as a set of guidelines providing a framework for operation, allowing for learning and experimentation as the novelty and diversity of the circular economy makes it currently difficult to specify rigid targets and timelines.

The design of a politically supported vision for the circular economy provides the security to begin working on circular innovations. This applies to city practitioners but is particularly relevant for market parties as well who are reassured of the circular ambitions of the city, allowing them to innovate and participate. Moreover, it assures that a holistic approach to the circular economy can be pursued.

Interview extract 1a (Respondent 2, Circular City Coordinator): From vision to roadmap,
"In 2013, we had a first brainstorm and consultation sessions with market parties on the CE. What is it, and what is the role of the local government? This led to a vision document on the 'circular metropole'. This was offered to negotiators of the new city government. Subsequently, this ambition as outlined in the vision-document was taken up in the coalition agreement (2014). In the beginning of 2015, this was translated into an integrated agenda for sustainability with five transition paths: sustainable energy, clean air, climate adaptation, the own organisation, and circular economy. The circular economy, at the same time, was determined as the umbrella-theme connecting all other themes (...). We do not work with quantified goals. Our strategy is to learn by doing - we cannot set quantitative targets because you simply cannot know. This is a completely new transition; the only way to move forward is by doing as there are no right indicators to use or follow."

Interview extract 1b (Respondent 10, Urban Economy Manager): Guidelines, not a plan
"The city is going to design guidelines for the long-term development of the circular economy in the city. Guidelines - not a plan. If you design a plan, you need a dedicated timeline; it requires resources, and competences - which we do not all have. (...) But designing a plan without a budget or time schedule is not a plan and is dangerous as it leads to unmet expectations. It is important to frame the transition as learning by doing, as a vision. Calling it a plan when it is not a plan can be damaging for all cities that are trying to become circular."

Introduce cross-thematic coordination and promote a culture of cooperation and knowledge exchange and creation within the own municipal organisation

Trans-department cooperation as well as continuously driven innovation and coordination of circular economy efforts in the city are perceived as being crucial. One of the key strategies that was identified to facilitate this is the instalment of a circular economy coordinator or coordination group with strong management skills. Especially if this unit includes a group of multidisciplinary people from various relevant municipal departments (e.g., from the strategy and planning, economic development, environmental management, and public relations departments), this can create a movement throughout the organisation and provide contact points with knowledge on the CE for staff working the entire width of the administration. In addition, a coordinator and/ or coordinating team allows for the pursuit of internal cooperation amongst all relevant departments and can work towards alignment of departmental ambitions, projects, and expectations. Without a coordinator for the circular economy, it is difficult to keep track of the larger scenario and direct all of the initiatives in the right direction. Without this 'helicopter view', a city risks losing track of the vision and developing projects in silos nonetheless.

A second strategic option is to entirely redesign the administrative level structure from silos into a more holistic form of organisation. This demands adjustment of instruments and methodologies to match the multi-disciplinary forms of cooperation and decision-making.

Whatever option is pursued, a culture of learning by doing and investments in knowledge creation within the individual organisation are considered to be essential. Activities such as trainings, lecture nights, field visits, research into the required and available competences needed for every new activity, and examining processes and tools used by other cities can all create understanding and support for the move towards a circular economy within the individual organisation.

In the case of individual circular projects, it is also regarded as very important to appoint dedicated project coordinators and, in the event of projects with strong signalling effects, appoint a special working group. The project coordinators should be experts or entities with substantive knowledge of the circular goal that is being pursued and sufficient connections to local partners and civil society. In some of the cases analysed, the appointed project coordinators did not work for the municipality but were external experts/entities.

Interview extract 2a (Respondent 4, Managing Director of one of the project participants for the regional industrial demonstration park): Project group coordination
"Within our project, the key coordinator is the CEO of the regional circular and biobased economy platform. This person functions as the coordinator, as the 'glue between all participants', and arranges meetings and aligns ideas. This is a crucial factor for success. Someone has to own and organise the project, especially with so many partners cooperating, but also to keep the project going, to ensure funding is acquired and allocated properly, and that actions are taken when necessary."

Interview extract 2b (Respondent 2, Circular City Coordinator): Circular coordinator for the city
"My role is that of the programme coordinator for the circular economy for the municipality. We have many project managers in a wide variety of municipal departments all involved in this circular economy programme. This creates integration of the circular economy on all levels and helps to have a contact point within the various departments. This way, you create a movement together through the whole municipal organisation. I think it is important to stress that, from the beginning on, you need to cooperate with the whole range of relevant departments within the own municipal organisation - do not leave it in the environmental department, for instance."

Interview extract 2c (Respondent 7, Representative of the Ministry of Environment): Flexible coordination
"We have one dedicated programme coordinator, but, for every separate action that is being implemented, we make one person responsible whose role is to set up an action group and find solutions. Moreover, we have one coordinator per team (logistics, waste, food, etc.). We work through an online platform to share information, so this requires much cooperation, but we are used to that".

Interview extract 2d (Respondent 12, City Policy Advisor): Renewed administrative structure
"Our administration was reorganised two years ago in order to facilitate more integrated planning. We are now organised in such a way that we work in two departments, meaning we work in projects and no longer in administrative silos. So, for a project like the climate action planning, we are sitting together with people from previously very different

departments. The idea is that this structure makes it much easier to get all the teams included in project coordination and execution. But, in reality, this form of work organisation remains to be very difficult. There are a lot of projects, but the mainstream instruments to facilitate and structure this sort of integrated planning are not yet in place. This requires more investments and efforts still."

Identify, address and include non-municipal stakeholders early on in the transition process (e.g., businesses, citizens, and other relevant stakeholders) - in order to craft the process together to come to circularity within an urban context.

This is predominantly based on the concept that the city alone cannot make the circular economy happen. It is a partner in the urban transition to the circular economy, not the director. The transition is a co-creating process in which market parties, knowledge institutes, and also citizens ideally have the lead; the city needs to facilitate the appropriate conditions for innovations to occur. This means including relevant stakeholders right from the very beginning before deciding on the vision, agenda, and guidelines for the transition (in the cases analysed, the earliest involved stakeholders were mostly market parties and knowledge institutes). However, this also means facilitating cooperation between non-municipal stakeholders by providing access to networks, for instance, or by actively bringing them together and/or developing detailed plans together with sector parties for specific value chains.

Interview extract 3a (Respondent 2, Circular City Coordinator): Immediate inclusion of urban stakeholders

"Our starting point for this transition is also that companies and citizens are the driver, that we have a clear role to play mainly from procurement power but that we only facilitate, not push, the transition. We are not going to do something that is not supported by the market. So, for our research, we already included a large variety of regional market parties right from the very first brainstorm sessions. Subsequently, we have expanded this by organising roundtables (...) to which also residents were invited. We think it is crucial for cities to do extensive market consultation and cooperation before deciding upon a development strategy so you can really grasp what the best starting point can be (with the most support, red.).

Interview extract 3b (Respondent 7, Representative of the regional Ministry of Environment): Early and continuous urban stakeholder consultation

"(Before developing the regional circular economy plan, red.), we organised a big meeting with a wide variety of stakeholders (about 60) from inside the regional organisation itself, from companies, civic society, etcetera, and discussed what the main themes are that we would have to address in the plan. Now (after completion of the CE plan, red.), we put innovative questions on the market and finance research with market parties. We work mostly with market parties and local knowledge institutes and not with universities. This multi-stakeholder aspect of our cooperation makes it successful. We integrate opinions and knowledge of parties and people of all possible involvement levels."

Interview extract 3c (Respondent 12, Policy Advisor): Project-based stakeholder inclusion

"We are currently involved in a variety of circular initiatives. Within these kinds of external projects, we as the municipality mainly act as the driving factor and take up a coordinating role. But we involve other parties for execution. We work with all kinds of stakeholders

available that we identify depending on the project. Market parties, research institutes, but also NGOs or other civil organisations".

Analyse the urban metabolism (material and energy streams, bio-sources, and sinks) as a basis for developing a strategic plan for the CE transition with contextualised priority sectors.

Mapping the urban flows of materials, energy, heat, water, bio-resources, and waste to clarify what resources exist in the city (referred to as, among others, urban metabolism scan, city scan, urban flow analysis). This information can be used to identify which urban sectors have the greatest potential for circular developments and where opportunities for circular innovations lie in the various value chains. This helps to start innovations off in the right direction from the very beginning.

Interview extract 4a (Respondent 1, Innovation Manager): Low hanging fruits
"We started off with a metabolism scan for the city to understand where the so-called 'low hanging fruits' were. In this scan, we focussed on which sectors in the city would be worthwhile to start most CE innovation in."

Interview extract 4b (Respondent 9, Environmental Department Representative): City scan as a facilitator of a holistic programme
"We do have a lot of separate projects in the city, but they are not connected. To increase consumer awareness, we would need to invest in more interconnected circular projects instead of not connected distinct projects. I think we have reached a time in our development that we need to invest in a holistic strategy for the circular economy based on the city scan so that we can work on a more integrated, holistic development of the CE."

Educate consumers (and other stakeholders) in civil society and, more in particular, in cities based on an inclusive and participatory approach. In order for the CE to thrive in an urban context, co-creation with citizens is crucial from the beginning.

As outlined above, citizen awareness on the circular economy is still insufficient. It is crucial to increase citizen understanding of why a circular economy and what they can contribute are relevant. However, this is not a one-way street as citizens should be involved and consulted as well. Citizen platforms where they can voice, debate, and prioritise their ideas to improve the city or the facilitation of co-creating spaces where people can connect, network, and share ideas are all possibilities to foster increased awareness and participation. Especially given the actual highly exploratory stage of a CE, citizens should be provided with the mental tools and practical skills to engage in context-bound experiments.

One of the ways to increase public knowledge levels is to work towards a city-wide basic knowledge level about sustainability (and specifically the circular economy, as can be observed in, e.g., the UAPCE cases of Vilvoorde, Eskiltuna, and Ljubljana Green Chains). This means cities would have to pursue a dedicated educational policy aimed at including the topic of sustainability (and potentially the circular economy) across an entire range of educational systems within the city's environment. It would be even better if this could be embedded in primary and secondary education as well as in in higher education such as universities and informal institutions; however, these systems are out of reach for cities.

Interview extract 5a (Respondent 5, CEO of the city's organisation for eco/ circular promotion): Making the circular economy visible
"(...) Also for this project, the participation of citizens is key. We organise many events and initiatives aimed at informing them, getting them involved, for example, workshops in which they can provide input on the plans and planning. Moreover, we actively include citizens in the circular economy as we are re-opening a part of the city (which is being redeveloped based on circular principles, red.) to the public that had formerly been closed off. People can visit it again, people can see it, and get more eager to support circular development. And even provide pressure to the politicians to proceed these innovations.

Interview extract 5b (Respondent 8, Representative of urban CE Project Group, former alderman): Learning from citizens
"Citizens' acceptance is now the next step. This is planned for next year, through conferences, for instance. For the strategic development plan (for which the main body is finished, red.), we want to let citizens be able to comment and make suggestions which we will take into account before finalization. Because, in my opinion, people that come to those consultations are people that really want to be there so they often have either relevant comments or really good additional ideas. They come to share their opinions, hence you have to respect that."

Interview extract 5c. (Respondent 9, Representative Environmental Department): Demanding participation and communicating best practices
"To increase consumer awareness, we ask that they participate in projects. For instance, we actively invited citizens to join and help by pointing out that it is their city, their green areas in which they can invest this way. This we do together with district departments and sometimes local NGOs. It does not always go as smoothly as we want, of course. Sometimes, such campaigns lead to resistance more than participation; but then, we have to deal with that and design our programme differently the next time. Involvement of local media is helpful for us to spread our message. The local media is curious about innovative ideas. Sometimes, they do not accept ideas that we have but, if they pick up on a project that they like, this is useful for us as it provides positive coverage. Moreover, we give back to the citizens as well. For instance, their increased separation efforts have led to lower waste-bills. So, these practical improvements help show the impact of their actions".

Better funding

Use circular public procurement to create demand for circular innovations

Shifting to circular public procurement is perceived as one of the most effective administrative instruments that cities have to incentivise the development of markets for circular goods and services. By procuring (at least a certain level of) circular goods and services instead of those only based on price, municipalities can act as a launching customer and facilitate demand which are specifically important in the phases when new innovative companies have recently entered the market.

Interview extract 6a (Respondents 1, Innovation Officer, and 2, Coordinator Circular Economy): Experimenting with circular procurement and tenders
"We actively look at our own instruments. Which of our own actions can we alter so that it supports the circular economy? The first, of course, is procurement. Another example is soil allotment. Now, we use tenders to demand more circular use of those soils. We started three

of these tenders last year as an experiment, learning by doing." "Nevertheless, it is paramount that we learn to speak the same language. When we are talking about circular spatial developments, every party needs to understand what we mean. This is why, for this specific tool of land allotment, we have made the route map together with market parties. This will reduce confusion greatly and ensure we are all on the same page."

Interview extract 6b (Respondent 6, CEO of a Circular Advisory Company): Procuring circular on all scales
"There is a lot of potential for public procurement. Going for refurbished furniture, for instance, pursuing the leasing of light instead of buying it, etcetera. Even on small things in the daily routines, cities can thoroughly look at their own organisation to see how they can procure more circular and probably also to see where they reduce in the first place."

Interview extract 6c (Respondent 11, Energy and Environment Department): Joining regional procurement initiatives
"At this point, our procurement is not yet sufficiently circular; it is not yet a dedicated task of the procurement department nor is the demand for sustainability (let alone circularity) sufficiently institutionalised amongst administrators. However, we are now part of the Flemish circular procurement programme which is becoming more and more successful"

Identify external sources of EU and national funding for CE initiatives and projects to complement the cities' own budgetary sources and become acquainted with their rules and procedures

Many cities addressed the need of external funding for circular economy developments. As in general cities have traditionally relied on their own budgetary sources to fund investments they are often not aware of external sources of funding/financing and the specific rules and procedures. Nevertheless, increasing budgetary restrictions are forcing many cities to look out for such external funding/financing sources. Several of the cities interviewed explained the merits of becoming familiar with the available EU and national funding sources for circular initiatives as a complementary source of funding. In some cases, even special staff members are installed to obtain maximum potential funding.

Interview extract 7a (Respondent 11, Energy and Environment Department): Use of sustainability funds and dedicated staff members
"Whenever it is possible to get a subsidy, we try to do so. For us, an important funding source is the regional administration. The regional government has a sustainability budget available that is not particularly aimed at the CE but can be used for CE projects - hence, I dedicate the funds we get from that budget to circular initiatives."

"Within our department, we have someone available that dedicates 50% of the time to acquiring European subsidies to be able to initiate the projects on our agenda and also the staff on our team. I think about half of the team is subsidised."

Interview extract 7b (Respondent 8, Representative of urban CE Project Group, former alderman): Legitimacy by EU funding
"The recognition that you get from, for instance, being in an EU-project or getting EU-funding, helps to generate acceptance and support as people then recognise that it must be something to take seriously, something that is relevant."

Interview extract 7c (Respondent 12, Policy Advisor): Gaining 'subsidy experience'
"The extra tasks require extra money, but we are not used to acquiring external funding; we are not organised as such. We do not have the networks and experiences yet to manage to get sufficient funding to the city. We need to work on both things together. We do not even know of all available funding yet. Now we mainly work with Interreg, which is valuable for some things but not for everything."

Better regulation

Facilitate appropriate spaces and funding for experimentation, (private) innovation, knowledge transfer, and match-making in the field of CE for businesses, research institutions, and interested citizens

Within these experimentation zones, current rules and regulations are not (fully) applicable or complied with which allows for far-reaching experimentation and innovation. See, for example, Copenhagen (http://copenhagenlivinglab.com) or the Circular Buiksloterham Community in Amsterdam (https://buiksloterham.nl). Stakeholders can begin experimenting with material flows and resource streams without having to wait for top-down modifications of the legal framework.

Interview extract 8a (Respondent 2, Circular Economy Coordinator): Supporting role for the city
"We are often only slightly involved in these initiatives that are coming from the market and research institutes. Predominantly, we are involved by offering the city as living lab. We can then facilitate in data provision, networking, linking parties."

Interview extract 8b (Respondent 12, Policy Advisor): Linking the front runners and laggards
"For most companies in the region, the CE is still very much in a primary phase. There are some front-runners, but they are so far away that they lost touch with the mainstream companies. We do see a role for ourselves to bring the front-runners and other companies back together, back to reality. Allowing them to get (re-)acquainted, discuss what projects could be realised, make agreements. Facilitate development from scratch to execution. We are already doing this for energy, but not yet for the CE. Companies are interested in innovation, but sometimes they just need an external incentive to get at the table, talk about it, and see what comes out. That is something what we can facilitate."

Interview extract 8c (Respondent 8, Representative of urban CE Project Group, former alderman): Supporting local NGO's through location facilitation
"Next year, we want to facilitate physical space for organisations that want to be active in this field (circular economy, red.), to be located in a physical area where everybody is talking about the CE. These are mainly NGOs that are working in the CE field. We are trying to connect them in this way. We facilitate the locations for a very low price."

Create forums with like-minded cities at the national (and possibly also at the EU) level to lobby for necessary changes in EU and national legislation that currently block the transition to a CE

The Circular City Deal in the Netherlands described in the previous section (initiated and led by the City of Amsterdam) is a prime example of an intervention that cities can implement to

increase their influence on national authorities to remove regulatory barriers created by legislation established at the national (or regional) level.

Interview extract 9 (Representative 1, Innovation Manager): Circular City Deal
"We try to consider waste as a resource. But, unfortunately, national regulation blocks that perspective, and we cannot change that directly. However, to try to overcome this barrier, we have initiated the Circular City Deal: we asked other cities in the Netherlands to join us in writing a document in which we put the main topics for better cooperation between the cities and the national government. Reconsidering obstructing regulation is part of that. This City Deal was signed in 2016 and is currently being elaborated."

Continuous monitoring and evaluation of the implementation of circular projects and initiatives with the aim of developing a solid knowledge base and providing feedback to guide/adjust the transition process

Not yet operationalised by most cities are management systems to measure and evaluate the progress made in the process towards urban circularity. However, it is considered by many parties as being an important tool to develop. Only very recently (February 2018) did the Dutch Government release a draft report called 'Monitoring Framework for the Circular Economy'. This framework is a first national attempt to propose and discuss a set of generic indicators regarding the measurement of progress. There is such a generic attempt as well on an EU level: http://ec.europa.eu/environment/circular-economy/pdf/monitoring-framework.pdf. This EU framework is based upon already existing online instruments such the Resource Efficiency Scoreboard and the Raw Materials Scoreboard. It could be of value for the UAPCE to consider the development of such a framework specifically suited for the ambition of developing circularity in an urban context.

Interview extract 10 (Respondent 2, Circular Economy Coordinator): In-process evaluation
"In addition, we are going to evaluate our efforts throughout the process. Not only in hindsight but particularly also to identify what the lessons learned so far imply for the focus and future implementation of the programme. These evaluations will be an important knowledge-base for future developments."

3.4 Additional guidance material on circular economy for cities

3.4.1 Publically available documentation

The first additional research activity covered the analysis of scientific literature and generic documents provided by expert organisations. This analysis provided an idea of what information is already available and to what extent this is relevant for practitioners within cities with the desire to move to a circular city. In total, two scientific articles and 12 generic articles were found, as presented below. Appendix 12 - Generic guidance documents provides a succinct analysis of the key points per article (mainly focussed at identifying barriers and interventions listed in the articles). A brief summary of the articles is provided below followed by an overview of the analysis of the articles on their respective themes, scope, and the value for city administrators (Table 1).

Scientific articles

Franziska, E., Florian, K., Sara, B., Leen, G., Steffen, M., & Markus, E. (2017). Urban sustainability transitions in a context of multi-level governance: A comparison of four European states. *Environmental Innovation and Societal Transitions*. Web link: https://www.sciencedirect.com/science/article/pii/S2210422416301289

Abstract: Urban sustainability transitions have attracted increasing academic interest. However, the political-institutional contexts in which these urban sustainability transitions unfold and by which they are incited, shaped, or inhibited have received much less attention. This is why we aim at extending previous studies of sustainability transitions by incorporating a multi-level governance perspective. While multi-level governance has been a long-standing theme in political science research, it has remained under-explored in the study of sustainability transitions. This claim is the starting point of our comparative analysis of urban sustainability transitions in Brighton (UK), Dresden (Germany), Genk (Belgium), and Stockholm (Sweden). Our approach "brings the politics back in" by elucidating the dynamics of power concentration and power dispersion generated by different national governance contexts. In our analysis, we explore which opportunities and obstacles these diverse governance contexts provide for urban sustainability transitions.

Prendeville, S., Cherim, E., & Bocken, N. (2017). Circular Cities: Mapping Six Cities in Transition. *Environmental Innovation and Societal Transitions*. Web link: https://www.sciencedirect.com/science/article/pii/S2210422416300788

Abstract: Urbanisation and climate change are urging cities to chart novel paths towards sustainable futures. Many cities are turning to the alluring 'circular economy' (CE) concept to guide this redirection. The CE concept re-imagines how flows of resources moving through economies might be 'closed'. Here, we explore this new 'circular city' *agenda by asking:* How are cities adopting the CE as a strategy*? We found that political leadership, building adaptable future visions, using experimental approaches (such as living labs), developing contextual knowledge about resource use, and engaging with diverse stakeholders to be important. However, we also expose that there is a lack of consensus on what a circular city constitutes and a need to further untangle the* how *and* why *of the circular city concept. The research contributes to the field by outlining emergent cases, identifying a set of common policy strategies, conceptualising a circular city, and identifying areas for future research.*

Generic documents

CEN / ACR (2015) – CEN General Guidelines on Circular Economy Strategies by Local and Regional Authorities. Web link: http://www.circular-europe-network.eu/library/general-guidelines/

This publication aims at explaining the potential role of local and regional authorities and helping them to draw up integrated and efficient circular economy plans. Even though acknowledging the broader concept, the guidelines focus mainly on materials considering that it is difficult for local and regional authorities to encompass all of the topics all at once and since material resources represent the core element of circular economy.

CEN / ACR (2017) - Roles of local and regional authorities towards the prosperity of local SMEs. Web link: http://www.circular-europe-network.eu/library/thematic-guidance-material/

Accelerating the transformation to a circular economy requires both a global and a local approach simultaneously: global multi-stakeholder collaboration for large-scale systems

change (in finance, technology, and supply chains), combined with specific localised systems change (in cities, regions, countries). Governments must create across-the-board connections between stakeholders at all levels whether they are private companies, public authorities, scientists, academia, or consumers. This document completes the "CEN general guidelines on circular economy strategies by local and regional authorities" with examples of good practices to set actions specifically for local SMEs. Members of ACR+ have contributed to this study by providing information on circular economy actions that they have implemented on their territories.

Circular Cities Hub (2016) - Circular Cities Strategies Challenges and Knowledge Gaps. Web link: http://circularcitieshub.com/wp-content/uploads/2017/06/Circular-Cities-Strategies-Challenges-and-Knowledge-Gaps-Page.pdf
This document reports on the discussions and conclusions of the inaugural workshop on circular cities organised by Circular Cities Hub. The workshop was held in London on 26 September 2016, sponsored by UCL Grand Challenges and in association with the Ellen MacArthur Foundation. It brought together academics, policy-makers, consultants, and think-thanks to develop an understanding of the circular city concept and the challenges to implementation. The workshop was centred on three themes: strategies for delivering circular cities, challenges to the transformation to circular cities, and knowledge gaps.

De Groene Zaak & WBSDC (2015) - Governments going circular A global scan by De Groene Zaak (Dutch Sustainable Business Association). Web link: http://www.govsgocircular.com/media/1354/governments-going-circular-dgz-feb2015.pdf
All over the world, a growing number of companies have started to develop and apply circular business models. Governments have good reasons to act as well: the circular economy strengthens the economy by saving on valuable resources, stimulates innovation, and offers the promise of millions of new jobs. Given the importance of governmental intervention in establishing a circular economy, the Groene Zaak and WBSDC have set out on a journey to identify best practices worldwide. The publication Governments going Circular - Global Scan Best Practices *comments on the best practices found and provides ideas for circular transition.*

Deloitte (2017) - Breaking the Barriers to the Circular Economy. Web link: https://www2.deloitte.com/nl/nl/pages/risk/articles/breaking-the-barriers-to-the-circular-economy.html
This report discussed the joint research project on barriers to the circular economy in the European Union. Two types of barriers emerged as main barriers: (1) cultural barriers of lacking consumer interest and awareness as well as hesitant company culture, and (2) market barriers, particularly low virgin material prices and high upfront investment costs. Government intervention might be needed to overcome the market barriers which then may also help to overcome cultural barriers. Cultural barriers also need to be overcome by circular start-ups. And, even though there is still no circular start up that has made global headlines, this may change soon. On the other hand are established firms with wait-and-see approaches regarding the circular economy who are adopting risky strategies.

EEAC (2017) - Europe Goes Circular. Web link: http://eeac.eu/wp-content/uploads/2016/04/Europe-goes-Circular.pdf

In this document, we analyse whether and how Europe is moving to a circular economy by examining the situation in countries and regions in which an EEAC member council is located.

Ellen MacArthur Foundation (2017) - Cities in the CE - An Initial Exploration. Web link: https://www.ellenmacarthurfoundation.org/publications/cities-in-the-circular-economy-an-initial-exploration

This paper outlines some of the challenges cities are facing in today's linear economy, explores the alternative of a 'circular city', and collates our research to date on the benefits of a circular economy for cities. Finally, it outlines outstanding questions on the topic, suggesting possible avenues of research for the future.

Ellen MacArthur Foundation (2015) - Policymaker Toolkit. Web link: https://www.ellenmacarthurfoundation.org/programmes/government/toolkit-for-policymakers

The circular economy offers business leaders and governments a clear opportunity for long-term growth that is less dependent on cheap materials and energy and which can restore and regenerate natural capital. This report complements the recently published report Growth Within: A circular economy vision for a competitive Europe by providing an actionable toolkit for policymakers. The report describes a methodology for circular economy policymaking. It also explores a range of policy options that Denmark – the country of the report's pilot study – could choose to pursue. The report does not recommend any specific policy intervention to Denmark or to any other country.

Ellen MacArthur Foundation & BAM (2017) - Circular Business Models for the Built Environment. Web link: https://www.ellenmacarthurfoundation.org/assets/downloads/ce100/CE100-CoPro-BE_Business-Models-Interactive.pdf

This study explores the benefits that circular business models (CBMs) offer stakeholders within the built environment sector. The report, supported by the Ellen MacArthur Foundation (EMF) as part of the framework of the CE100 programme, proposes a shift in the way the construction value chain has been historically seen. The global construction industry is the largest consumer of resources and raw materials of any sector, which creates significant challenges for the adoption of CBMs. To overcome these challenges, the study reviews different solutions that can help businesses save on raw material and waste management costs. These include the adoption of long-term design thinking; the role of technology and innovation; the adoption of new production and consumption models; and collaboration throughout the supply chain and the lifecycle of a construction asset.

Ellen MacArthur Foundation & Google (2017?) - Cities in the circular economy: The role of digital technology. Web link: https://www.ellenmacarthurfoundation.org/assets/downloads/Cities-in-the-Circular-Economy-The-Role-of-Digital-Tech.pdf

The report explores a vision for the circular economy in an urban context. With the support of Google, the exploratory paper builds on the Ellen MacArthur Foundation's own concept paper, Cities in the Circular Economy: An Initial Exploration*, which creates a vision for a circular city, highlights outstanding questions on the topic and offers suggestions on future avenues of research.* Cities in the Circular Economy: The Role of Digital Technology *dives*

into the crucial role of technology in enabling key aspects of the transition towards a circular economy in cities.

European Commission (2014) - Scoping study to identify potential circular economy actions, priority sectors, material flows and value chains. Web link: http://www.eesc.europa.eu/resources/docs/scoping-study.pdf
The aim of the study is to provide an initial scoping assessment of potential priorities and policy options to support the transition to a circular economy in the EU. The study reviews existing literature, identifies potential priority areas for action where accelerating the circular economy would be beneficial and where EU policy has a particular role to play, and develops policy options for consideration across a range of areas.

ESPON, Interact, Interreg & Urbact (2016) - Policy brief on the circular economy: Pathways to a circular economy in cities and regions. Web link: https://www.interregeurope.eu/fileadmin/user_upload/documents/Policy_brief_on_Circular_economy.pdf
Based on concrete local and regional examples, ESPON, Interact, Interreg Europe, and URBACT have produced a policy brief outlining pathways to a circular economy in cities and regions. The project looked into the territorial potentials for a greener economy and concluded that the territorial dimension of a region is an important factor in the transition process. For example, the location of a region or city is important from two perspectives:

(1) the physical characteristics of a given region, e.g., a Mediterranean region quite naturally has different potentials than a northern or mountainous region, and

(2) the region's "connectivity", e.g., whether it is a peripheral or central region.

In addition, urban and rural regions have different roles to play: urban regions have a more dominant role in terms of being production centres but also as having the largest possibility to influence resource efficiency; rural areas have another role in providing the resource base.

Table 1. Description of the themes, scope and value for cities per article

	Themes?	***Nature - Generic advice or very detailed/ sector specific?***	***Based on real cases?***	***Useful for practical guidance for cities?***
Franziska et al. (2017) Urban sustainability transitions in a context of multi-level governance: A comparison of four European states	Multi-level governance - governance contexts of sustainability transitions	Specific advice on necessary characteristics of the political environment for the benefit of sustainability transitions	Yes	Useful to increase understanding of the governance context in which a specific city resides and what that means for sustainability transitions
Prendeville et al. (2017) Circular Cities: Mapping Six Cities in Transition	Policy/ circular economy as a strategy	Generic - inquiry about the various ways cities are moving towards a circular economy. Advice on common policy strategies.	Yes	Useful as the article provides insights into other cities' experiences with the circular economy (Amsterdam, Barcelona, Glasgow, Haarlemmermeer, Rotterdam)
CEN / ACR (2015) - Circular Cities and Regions	Policy/ strategic actions	Generic, aimed at initiation of circular city developments	No	Yes, most to-the-point guide for cities to look into in terms of strategies for circular change
CEN / ACR (2017) - Roles of local and regional authorities towards the prosperity of local SMEs	Policy/ strategic actions	Specific, aimed at the support of local SMEs	No	If a city is interested in the support of local SMEs
Circular Cities Hub (2016) - Circular Cities Strategies Challenges and Knowledge Gaps	Policy/ strategies	Generic, results of a workshop on circular city strategies and challenges, aimed at developing a general understanding of the circular city concept	No, but experts and circular city stakeholders were involved in the workshops	No very specific suggestions, plus alternative approach to the circular used.
De Groene Zaak & WBSDC (2015) - Governments going circular A global scan by De Groene Zaak, Dutch Sustainability Business Association	Policy, governance	Generic, aimed at governments, in general, not particularly cities	No	Not specifically aimed at cities although some suggestions for policy interventions can be applied by cities as well

Deloitte (2017) - Breaking the Barriers to the Circular Economy	Concepts of and barriers to the circular economy	Generic, introductory texts aimed at disseminating recent research on the CE	No	Not specifically useful for cities
EEAC (2017) - Europe Goes Circular	Policy, regulation	Aimed at European policy and strategic activities towards the CE	No	Not aimed at cities
Ellen MacArthur Foundation (2017) - Cities in the CE - An Initial Exploration	Mainly policy	Generic, introduction to the link between and potential for circular economy development in cities.	No	Introductory text more than advice. Provides insights into potential sectors to focus on.
Ellen MacArthur Foundation (2015) - Policymaker Toolkit	Policy	Specifically aimed at policy-makers, more at the national level than the urban level	No	Not aimed at local governments
Ellen MacArthur Foundation & BAM (2017) - Circular Business Models for the Built Environment	Value chain adaptation and new business models	Specifically aimed at the construction sector	No	Not aimed at cities
Ellen MacArthur Foundation & Google (2017) - Cities in the circular economy the role of digital technology	Strategy (digitalization)	Aimed at outlining potential of digital technology for the transition to the CE	No	Provides generic insights into the role of digital technology for urban CE development
European Commission (2014) - Scoping Study CE	Policy, regulation	Generic, large scoping study aimed at identifying strategic policy options enabling the transition to a CE	No	More relevant for European administrators than local administrators
Interreg, Urbact et al. (2016) - Policy brief on Circular Economy for Cities and Regions	Policy and strategic actions	Generic, provides general steps to take as a city when moving towards a CE	No	Yes, the document provides suggestions on initial steps to consider when investing in circular city developments

General findings

Limited availability of guidance documentation for circular city practitioners

After an elaborate desk-research, only a total of 14 documents were located that were potentially covering relevant information on cities and the circular economy. Of those 14 documents, merely four were considered as having a relevant information basis for local officers that aim to increase their knowledge on how to approach the transition to a circular city: the article by Franziska et al. (2017), Prendeville et al. (2017), the CEN report on Circular Cities and Regions (2015) and the Policy brief on Circular Economy for Cities and Regions by URBACT et al. (2016). Of those four documents, the CEN general guidelines on circular strategies for local and regional authorities and the Policy Brief by URBACT et al. seem to be the most relevant reports for city practitioners that are currently available to offer advice for the transition to a circular city. The outcomes of the assignment as presented above confirm this as several of the identified governance interventions overlap with the suggestions that are also in the CEN report and the Policy brief. The article by Franziska et al. is less relevant as it describes sustainability transitions, in general, and not circular transitioning per definition. The article by Prendeville et al. is more of an analysis of current experiences of a pool of cities than concrete advice. Most other reports were either aimed at specific sectors (e.g., on the construction sector (Ellen MacArthur and BAM 2017) or on digitalization (Ellen MacArthur and Google)) or aimed at institutional levels other than the urban level (e.g., the European Commission (2014) and De Groene Zaak and WBCSD (2015)). Hence, the total number of documents that can be used as practical guidance for circular city practitioners in merely two.

Strategic advice preponderates

For the large majority of documents that were uncovered, independent of the institutional levels that these papers were addressing, the core focus was to provide insights into potential policy interventions and strategic actions to foster circular developments. Otherwise stated, the currently available guidance documentation provides general strategic advice but no detailed information on *how* to put this into practice. At the most, suggestions provided in the CEN+ report (2015) and the Policy brief by URBACT et al. (2016) can be considered as the most concrete. For example, in the latter document, the advice is conveyed to ‘Support local and regional stakeholders’. This advice is then substantiated with suggestions on what steps could fulfil this advice: ‘(by providing) financial support (..) which can take different forms, such as grants, loans, tax incentives or investment guarantees, either offered directly by the public sector or channelled via other actors, e.g., business associations or business development agencies’). Nevertheless, to-the-point examples of documents and step-by-step guidelines for circular cities thus seem, at least up to this point, to be non-existent.

Thematic focus largely overlapping

In addition, most of the advice that is provided regards strategic advice on knowledge creation (for example, on urban metabolism and/or relevant policy frameworks) and alternative forms of cooperation (in and outside the individual organisation). However, the reports also overlap in the information that is missing: suggestions on how to approach funding and financing issues, develop circular business models, involve civil society, and make the transition to the circular city an inclusive process is only minimally addressed in most documents, if addressed at all.

Little empirically grounded information available
In the documents found, only the two scientific articles made use of a methodological case study analysis. All of the other reports were based on literature and sometimes supplemented with interviews with experts but were not on the basis of practical real-life cases.

3.4.2 Quality frameworks for the circular economy

As an informative 'side-step' during this research, a short list of potential relevant 'management systems for quality' and their usefulness for circular city governance was compiled. This list was checked with the Dutch National Standards Organisations (NEN - https://www.nen.nl). For those interested in exploring one or more of these quality frameworks, a number of additional (internet) sources are added after each framework for further reference on the matter.

EMAS (1993): Environmental management and auditing system.
The Eco-Management and Audit Scheme (EMAS) is a voluntary environmental management instrument that was developed in 1993 by the European Commission focussing on eco-efficiency. It enables organizations to assess, manage, and continuously improve their environmental performance. The EMAS is now transformed towards the CE (2017) - see the report: This report contains a substantial number of links and sources enabling cities to apply an already existing framework (one that they might already be using in an urban context) to use as a reference guide in developing a step-wise approach. This is at no cost and contains a variety of metrics, models, and indicators.

Sources:
EMAS: ec.europa.eu/environment/emas/index_en.htm
EMASCE: ec.europa.eu/environment/emas/pdf/other/report_EMAS_Circular_Economy.pdf

BS 8001 (2017): British Standard Management model for the Circular Economy.
The BS 8001 standard provides guidance and recommendations that will help an organization turn the circular economy concept and theory into practical action. It will help provide environmental benefits through improved resource use in addition to delivering financial and social benefits through economic, employment, and innovation opportunities. BS 8001:2017 attempts to reconcile the far-reaching ambitions of the CE with established business routines. The standard contains a comprehensive list of CE terms and definitions, a set of general CE principles, a flexible management framework for implementing CE strategies in organizations, and a detailed description of economic, environmental, design, marketing, and legal issues related to the CE.

ISO 26000 (2010): Management model for social responsibility
This is perhaps the leading international standard that was developed to help organizations effectively assess and address those social responsibilities that are relevant and significant to their mission and vision, operations, and processes: customers, employees, communities, and other stakeholders as well as the environmental impact. It is based on seven core subjects and issues pertaining to social responsibility: organizational governance, human rights, labour practices, the environment, fair operating practices, consumer issues, and

community involvement and development. This standard is not intended to reduce the government's authority in addressing the social responsibility of organizations.

Sources:
Information can be found at: http://asq.org/learn-about-quality/learn-about-standards/iso-26000/ The ISO 26000 needs to be purchased. A critical review of the standard can be found at: https://www.degruyter.com/view/j/sbe.2016.11.issue-1/sbe-2016-0006/sbe-2016-0006.xml

Sources:
The BS 8001 standard can be obtained from the BSI Web shop: https://shop.bsigroup.com
Review: Stefan Paulink (2018). It is a critical appraisal of the circular economy standard BS 8001:2017 and a dashboard of quantitative system indicators for its implementation in organizations, Resources, Conservation and Recycling, Volume 129, February 2018, Pages 81-92, https://www.sciencedirect.com/science/article/pii/S0921344917303531

ISO 14001 (2015): Environmental Management Systems
ISO 14000 is a family of standards related to environmental management that exists to help organizations (a) minimize how their operations (processes, etc.) that exist help organizations (b) minimize how their operations (processes, etc.) negatively affect the environment (i.e., cause adverse changes to air, water, or land); (c) comply with applicable laws, regulations, and other environmentally oriented requirements; and (d) continually improve in the above. The requirements of ISO 14001 are an integral part of the EU EMAS. EMAS's structure and materials are more demanding and mainly concern performance improvement, legal compliance, and reporting duties. EMAS and ISO 14000 are both in accordance with the concept of eco-efficiency.

Sources:
The standard 14000 can be found here: https://www.iso.org/iso-14001-environmental-management.html. A preview is also available at: https://www.iso.org/obp/ui/#iso:std:iso:14001:ed-3:v1:en. It can be obtained from the ISO Web shop; see: https://www.iso.org/store.html

ISO 9001 (2015): Streamlining processes
This standard establishes the criteria for a quality management system and is the only standard in the family that can be certified. It provides a quality management system that is designed to help organizations ensure that they meet the needs of customers and other stakeholders while meeting statutory and regulatory requirements related to a product or service. It can be used by any organization regardless of its field of activity. This standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach, and continual improvement. There are over one million companies and organizations in over 170 countries certified as ISO 9001.

Sources:
Information can be found at: https://www.iso.org/iso-9001-quality-management.html. It can be obtained from the ISO Web shop, see: https://www.iso.org/store.html. The critical discussion regarding the pros and cons can be found here:

https://www.qualitymag.com/articles/92754-the-new-iso-90012015-why-its-still-relevant-and-what-are-the-changes

ISO 14040 (2006) Life cycle assessment (LCA)
ISO 14040:2006 covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies. It describes the principles and a framework for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

Sources: The ISO 14040 standard needs to be purchased, however, quite a bit of information is freely available on the Internet and in academic journals. Please check, e.g., http://journals.sagepub.com/doi/abs/10.1177/0734242X17730137

ISO 20400 (2017): Sustainable procurement
This standard provides guidance to organizations, independent of their activity or size, on integrating sustainability within procurement. It is a sector specific application of ISO 26000 Guidance on social responsibility, which it complements by focusing specifically on the purchasing function. It covers the political and strategic aspects of the purchasing process, specifically, how to align procurement with an organization's goals and objectives and create a culture of sustainability. It is intended for stakeholders involved in or impacted by procurement decisions and processes.

Sources:
A brochure on the functionalities of the ISO 20400 (2017) can be found here: https://www.iso.org/files/live/sites/isoorg/files/store/en/ISO%2020400_Sustainable_procur.pdf. It can be obtained from the ISO Web shop, see https://www.iso.org/standard/63026.html

AA 1000 (2011): Stakeholder Engagement Standard
A 'strange duck in the pond' of this collection of standards is the AA 1000.It helps to demonstrate how the process of stakeholder engagement is organised. It offers a principle-based framework applied by organizations of all sizes to inclusively identify, prioritise, measure, and respond to sustainability challenges and accountability. It is a generally applicable standard for assessing, attesting to, and strengthening the credibility and quality of organisations' sustainability reporting and their underlying processes, systems, and competencies providing guidance on key elements of the assurance process.

Sources:
More information can be found at http://www.accountability.org/standards/. The AA1000 standard has been widely discussed since its original release (1990s) see https://link.springer.com/chapter/10.1007%2F978-3-319-15838-9_11

SA 8000 (1997/2014): Social Accountability Standard
The SA 8000 is an auditable certification standard that encourages organizations to develop, maintain, and apply socially acceptable practices in the workplace. It measures social performance in eight areas that are important to social accountability in workplaces. It was established by Social Accountability International in 1997 as a multi-stakeholder initiative.

The SA8000's criteria were developed from various industry and corporate codes to create a common standard for social welfare compliance.

Sources: information can be obtained at http://www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&PageID=1689. Among many public sources, Wikipedia provides a decent 'brief' of SA 8000, see: https://en.wikipedia.org/wiki/SA800. A more academically informed consequence can be found here: http://www.emeraldinsight.com/doi/full/10.1108/IJOPM-12-2015-0730

GRI (1997): Global Reporting Initiative
The GRI Standards are the first global standards for sustainability reporting. They feature a modular, interrelated structure and represent the global best practice for reporting on a range of economic, environmental, and social impacts. It was launched as an international independent standard organization that helps businesses, governments, and other organizations understand and communicate their impacts on issues such as climate change, human rights, and corruption. Launched in 2000, GRI's sustainability reporting framework is now widely used by multinational organizations, governments, small and medium enterprises, NGOs, and industry groups in more than 90 countries

Source: https://www.globalreporting.org/standards/. The GRI is widely discussed around the globe regarding its reach, methodology, and applicability, see, e.g.: http://journals.sagepub.com/doi/abs/10.1177/097215090901000201

Synthesis Quality Frameworks
In the above, three major categories can be distinguished. The first are management models such as the EMAS, BS 9001, ISO 26000, ISO 14001, and LCA. They offer generic models that a city can use to design their own quality management system regarding predominantly environmental issues. The second group of standards focuses on the assurance of specific functions such as sustainable procurement (ISO 20400), stakeholder engagement (AA 1000), or social accountability (SA 8000). Finally, one internationally accepted reporting framework is provided (GRI). Unfortunately, many of these standards must be purchased or subscribed to. The exception is the EMAS framework which is especially interesting since a CE adoption is available.

While QM Frameworks do not replace the need to develop focused approaches to implement circularity in an urban context, they do provide assistance in the reflection to craft a dedicated approach. Management models such as those above provide a holistic perspective on the structure, the required (and not to be forgotten) elements, and the underlying process. The second group provides a dedicated framework for the assurance of specific functions. They can be very advantageous when developing the various steps in context-specific guidelines. Finally, since all of the work undertaken to create circularity with an urban context requires public accounting, standards that assure transparency in accountability either through the chosen structure of the process is quintessential. Briefly, QM Frameworks can provide helpful insights and tools in the process of fostering circularity in an urban environment.

More information about practices regarding the applicability of generic QMS in and or by a local public administration environment can be found at:

https://www.iso.org/obp/ui/fr/#iso:std:61386, or on environmental management-systems in the public administration sector:
http://susproc.jrc.ec.europa.eu/activities/emas/documents/PublicAdministration or
http://www.emeraldinsight.com/doi/abs/10.1108/00251749010002928. A more in depth analysis can be found in, e.g., the article of Botto and Comoglio (2013) entitled: Implementing environmental Management Systems in a Cluster of Municipalities: a case-study, see pdfs.semanticscholar.org/2fba/8d4b040f04cd5670689d6518d348d8af9637.pdf

4 Conclusions

4.1 Circular cities in Europe

Interest in the circular economy has been rapidly increasing over the past decade. Nevertheless, it can be concluded that the circular economy in European cities is still in its infancy and not as mainstreamed as the energy and climate agendas. The outcomes of the research have also shown that there are very few examples of urban circular economy projects available throughout Europe let alone examples of cities that are implementing such projects as part of city-wide multi-sectoral circular economy strategies and guidelines. Contrary to the circular economy, there are many more projects and strategies throughout Europe that pursue other sustainability topics and agendas (e.g., clean and sustainable transport, clean and renewable energy, green and low carbon economy). Also, there are many examples of urban projects and strategies for waste management and waste prevention which may contribute but do not represent actual “step changes” towards the circular economy (and, in some cases, only contribute to optimisation of the functioning of the linear take-make-waste system).

Only very few cities (in a small number of countries) have really initiated the journey to the circular economy, and the few front runners that exist are still in the experimentation phase. Fortunately, it can be concluded that these front-runner cities show an understanding of the circular economy which extends beyond the waste and environmental management perspective and explores the circular economy from a wider multi-sectorial economic development perspective.

The experiences of these pioneering cities can be used as examples for other cities that aim to begin with the move towards a circular city. It should be noted, however, that the current (known) barriers are manifold and, while solutions are being tested, they have not yet delivered conclusive results. Considering the lack of long-term records and a solid knowledge base, it is not possible to identify any *proven* concepts and/ or solutions that serve the circular economy in cities at this point in time. This further emphasizes why the action plan proposed by the UAPCE is so important. Despite the limited knowledge base on urban circular transitions, it is fruitful to share the experiences and lessons learned by the front runners (both from successes and failures) as they can be used as inspiration and a guidance tool for other cities with circular ambitions.

4.2 Barriers and interventions

The high level of confusion and lack of understanding on what constitutes the circular economy and what it requires is an important barrier for cities aiming to move to a circular economy. The novel and intensified forms of cooperation that are required to develop and implement circular projects and also to develop consensus on dedicated strategies and plans for the circular economy within the public administration of a city and within wider stakeholder groups in a city are also extremely challenging. This is particularly the case if the city decides to follow a holistic approach to the circular economy which is multi-sectoral in essence. The definition of a long-term circular vision and ambition can help in this respect. In

a similar vein, investing in the individual organisation is a fundamental criterion to be able to foster the transition and challenge these barriers of knowledge deficiency and increased cooperation. This can be achieved, for example, by pursuing centralised multi-disciplinary and multi-sectoral coordination for the circular economy across different departments within municipalities led by a dedicated circular economy coordinator or coordinating team and by educating and facilitating training for city staff and practitioners.

The vast majority of interventions and barriers that are identified are related to the knowledge domain which is a logical consequence of the still underdeveloped knowledge base of the circular economy in Europe. This does not mean the regulatory and funding interventions and barriers are less important. However, as long as the knowledge barriers persist, at least to the extent that they do now, the other two domains are perhaps less visible. Up to this point in time, most cities have not developed very much in their transition that they have ideas on how to use alternative regulatory or funding/financing strategies other than what is currently available and, consequently, are not yet aware of the possible barriers they might encounter while addressing these domains. This is particularly valid since local governments generally have fewer means to influence regulation that is mostly provided by the EU and national governments and financing/funding which is mainly provided by the private sector (investors, banks), the EU, and national sources. Expanding the available knowledge on which interventions local governments *can* implement in terms of regulation and funding and how they could renew or alternatively deploy administrative instruments within both domains can thus be fruitful. Within the better knowledge domain, it is worth noting that monitoring and evaluation systems to measure progress of circular developments are lacking. A well-functioning monitoring and evaluation system that ensures feedback to strategy and planning can be considered as a crucial support tool for circular transitions and paramount for effective learning by doing. Lastly, it is argued that, for the purpose of supporting cities that have not yet begun circular economy development, it is worthwhile to invest in showcasing the transition experiences of front runner cities (beyond the initial starting phase which is currently the only phase where information is available). This way, a guidance tool presented per transition phase can eventually be created that elucidates common barriers and possible interventions that cities can expect.

4.3 Guidance material for circular cities

Currently, only two practical guidance documents are publically available for circular cities (CEN+ (2015) and the Urbact Policy Brief (2016)). It may well be that more documents exist, however, these are not publically available. Moreover, these two guidance documents that are currently available provide strategic advice about the initial steps to take when moving towards a circular city. The guidance documents are less concrete when it comes to practical implementation. Nevertheless, this is understandable as, up until this stage, there are only minimal practical examples available that provide this information. These outcomes do stress the importance of further expanding the available information and knowledge base for cities with the ambition to initiate circular developments. Not only by increasing the amount of generic advice available but especially by also providing guidance material that is more detailed and provides information that is more in-depth regarding the most critical barriers and most important interventions for the transition to a circular city.

4.4 Recommendations for the UAPCE Action Plan

Based on the conclusions presented above and the results presented in Section 3.2., the following recommendations are outlined for the UAPCE to take into account in the implementation of the action plan. The recommendations highlight either additions to the actions already included in the Action Plan or provide further substantiation of or elaboration on the action points outlined in the Action Plan. The recommendations are clustered per UA domain (better knowledge, better regulation, better funding) and are presented in the coloured boxes below.

Recommendations *Better Knowledge*

Intervention or barrier identified through empirical research	Minimal attention for monitoring and evaluation of circular economy efforts, no replicable format or evaluation framework available.
Link to UAPCE action Plan	*Action Point 2.3.1. Prepare a Blueprint for a Circular City Portal: "The Circular City Portal shall include (...) a Circular city metrics/ indicators and metering/monitoring system.*
Recommendation	Develop (guidance on) monitoring and evaluation frameworks for circular city transitions.

Intervention or barrier identified through empirical research	There is a need for inspiration and guidance for cities that aim to pursue the development of a circular economy. Not only support when initiating the transition process but also providing insights into the transition process *beyond* the starting phase in the various stages of implementation.
Link to UAPCE action Plan	*Action Point 2.3.1. Prepare a Blueprint for a Circular City Portal: "The Circular City Portal (...) will promote the* ***further development, dissemination and sharing of new information and know-how on the subject with a focus on practical implementation issues****. Its main aim is to contribute to the creation of an openly shared knowledge basis that would inspire and guide cities in their journey towards a circular economy."*
Recommendation	Continuously monitor and map key barriers and interventions that front-runner cities experience and implement while moving forward in their transition process. This information can be used to expand the knowledge on the circular economy transition *beyond* the starting phase and can eventually be used for a 'phase-based guidance tool' for cities.

Intervention or barrier identified through	Only two practical guidance documents are publically available for 'circular cities'.

empirical research	
Link to UAPCE action Plan	*Confirmation of Action Point 2.3.1. Prepare a Blueprint for a Circular City Portal: "The Circular City Portal (...) Serves as a central point of access to information dedicated to the promotion of the circular economy in cities that is* ***freely available from various sources*** *including institutional web-sites and platforms in the public space, thus allowing interested cities and other stakeholders an easier and quicker access and navigation to the relevant information and tools they need."*
Recommendation	Improve the accessibility of general guidance documents for aspiring circular cities.

Intervention or barrier identified through empirical research	There is still much confusion and a wide range of interpretations on what the circular economy is, what the transition to a circular economy requires, and why it is relevant.
Link to UAPCE action Plan	*Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. "A Circular City Portal (...) (i) Serves as a* ***central point of access to information*** *dedicated to the promotion of the circular economy in cities that is freely available from various sources including institutional web-sites and platforms in the public space, thus allowing interested cities and other stakeholders an* ***easier and quicker access and navigation to the relevant information and tools they need****; and (ii) Promotes the further development, dissemination and sharing of new bespoke information, tools and know-how by and between cities with the aim to contribute to the creation of an openly shared knowledge basis that would inspire and guide cities in their journey towards a circular economy."*
Recommendation	Expand general understanding and knowledge of the circular economy through the development of a publically accessible Circular City Portal outlining the key characteristics of the circular economy and the necessary steps for the transition to it.

Intervention or barrier identified through empirical research	The circular economy is often only regarded from a waste or environmental management perspective instead of from a wider multi-sectoral economic development perspective.
Link to UAPCE action Plan	*Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. The blueprint "shall (...) include the following (but not limited to) preliminary list of topics identified by the Partnership: (1) Development of* ***circular economy strategies and roadmaps, circular business models and value chains*** *(i.e. for food and bio-wastes, for*

	building and construction materials/wastes, etc.) with mapping of key success factors, obstacles/barriers for implementation and mitigating actions; (...)". Also of Action Point 2.3.3. Develop a Circular Resource Management Roadmap for Cities'.
Recommendation	Provide publically available information and support tools that explain what the transition to a holistic circular economy means and how this can be pursued. In addition, address when and how to implement a circular city scan (as described in Action Point 2.3.3.) as the starting point for circular development from a resource perspective.

Intervention or barrier identified through empirical research	Circular projects require new levels of cooperation and coordination amongst all stakeholders involved. This is difficult to organise.
Link to UAPCE action Plan	*Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. The blueprint "shall (...) include the following (but not limited to) preliminary list of topics identified by the Partnership: (...) (2) Strategic governance options/tools/levers of change focusing on policy/strategy development, spatial planning,* ***multi-stakeholder coordination/cooperation processes****, permitting/ licensing, economic incentives/disincentives, public awareness and education; (3)* ***Stakeholder mapping and analysis tools****".*
Recommendation	Provide an information basis to (1) assist cities in identifying relevant stakeholders and (2) to assist them in better organising and/or coordinating multi-stakeholder collaboration after identification of relevant urban stakeholders for each project or programme.

Intervention or barrier identified through empirical research	Citizens' awareness and participation is minimal.
Link to UAPCE action Plan	*Confirmation of the relevance of Action Point 2.3.1. 'Prepare a Blueprint for a Circular City Portal'. The blueprint "shall (...) include the following (but not limited to) preliminary list of topics identified by the Partnership: (...) (9) Social (behavioural) side of a transition towards the circular economy (****i.e. how citizens will be involved in the transition process, how to communicate and reach out to the citizens****).* *In addition, Action Point 2.3.3. Promote Urban Resource Centres for waste prevention, reuse, and recycling is argued to be a relevant tool to spur citizen involvement. As already*

	suggested in the UA Action Plan, these centres can be used as physical locations were citizens can learn, co-create and share ideas about the circular economy.
Recommendation	Develop strategies for the inclusion of citizens and the deployment of the circular economy as an inclusive process. Examples of several of the cases presented in this research could be used, among others, the facilitation of urban resource centres. Not only focussing on unilateral dissemination of information on the CE but particularly also aimed at processes of inclusion and co-creation.

Recommendations *Better Funding*

Intervention or barrier identified through empirical research	Use circular public procurement to create demand for circular innovations. Shifting to circular public procurement is considered as one of the most effective administrative instruments that cities have to incentivise the development of markets for circular goods and services. However, including circularity as a procurement parameter is not common practice in most cities.
Link to UAPCE action Plan	*Action Point 2.3.1. Prepare a Blueprint for a Circular City Portal can be of use to cities that aim to pursue circular procurement, as the Blueprint aims to "include the following (but not limited to) preliminary list of topics identified by the Partnership: (...) (6) Circular procurement guidelines".*
Recommendation	In the Circular City Portal, ensure the procurement guidelines not only explain the relevance but also provide guidance on how cities can shift to and institutionalise circular procurement.

Intervention or barrier identified through empirical research	Lack in knowledge of what interventions cities can implement to overcome funding barriers. This specifically relates to the implementation of new instruments or the alternative deployment of existing administrative instruments.
Link to UAPCE action Plan	*Addressed by Action Point 2.1.2. Prepare a Circular City Funding Guide (CCFG) "This guide is intended to help cities identify and access suitable sources of funding and financing for their own circular projects as well as for projects promoted by private and public entities in their territories. The guide will also build knowledge on how to design and set up effective funding schemes for circular city projects, taking into consideration their varying types, sizes and risk profiles."*

Recommendation	Expand the content of the CCFG to include knowledge on potential alternative deployment of existing financial instruments as well as examples of novel instruments (if existing) that cities can use.

Recommendations *Better Regulation*

Intervention or barrier identified through empirical research	Lack in knowledge on the interventions that local government can implement in relationship to regulatory barriers. This specifically relates to new instruments or the alternative deployment of existing administrative instruments.
Link to UAPCE action Plan	*No Action Point addressing this topic.*
Recommendation	Include a new Action Point or a sub-theme of the Action Point 'Circular City Portal (2.3.1.) describing how cities could work towards the removal of obstructing national legislation, i.e., by setting up City Deals with like-minded cities (and potentially other stakeholders such as market parties).

Intervention or barrier identified through empirical research	The current tax system obstructs the development of a circular economy
Link to UAPCE action Plan	*Addressed by Action Point 2.1.3 'Explore how economic incentives can support the circular economy in cities' the Action Point mentions "the potential of a coordinated system of taxation"*
Recommendation	Support cities in overcoming the critical barrier of obstructing tax systems by further researching Action Point 2.1.3 and work towards suggestions for an alternative tax framework.

Intervention or barrier identified through empirical research	Waste legislation hampers circular economy development. The legal status as 'waste' often hinders innovative reuse and/ or recycling of products and materials.
Link to UAPCE action Plan	*Confirmation of the relevance of Action Point 2.1.1. Develop "(...) a proposal for setting up a regulatory framework that better fits the requirements of using secondary resources in the context of a circular economy."*
Recommendation	Support cities in overcoming the critical barrier of obstructing (waste) legislation by further researching Action Point 2.1.1 and work towards an alternative framework as described in the Action Point.

Intervention or barrier	

identified through empirical research	City development strategies are currently often made in silos.
Link to UAPCE action Plan	*No Action Point from the UA Action Plan addresses this topic directly.*
Recommendation	Address this topic as a separate Action Point or possibly as part of the Circular City Portal (Action Point 2.3.1). This could take the form of a guidance tool for or simply examples of the various options that cities must have to address the disconnection between the administrative silo-structure versus the requirements for holistic decision-making (see this report).

Appendix 1 - Terms of Reference

Not available in the public version

Appendix 2 - Addendum to the Terms of Reference

Not available in the public version

Appendix 3 - Analysis format

(A) City and country

(B) Name of the project

(C 1 & 2) When was the project initiated (year)? What is the actual status (still operating or stopped; if so, when and why?)?

(D 1 & 2) Circular objective: what is the (central) problem or ambition addressed in the case? Please provide a brief description of the circular actions planned/ implemented.

(E) Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, and civil society/NGOs. Please add if, in a specific case, other stakeholders are involved.

(F) (Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories of lack of funding, lack of appropriate legislation, and lack of knowledge with one or more of the stakeholders (D).

(G) Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building.

Check and specify what actions have been taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F).

Note that, in some cases, the governmental actions described do not relate to the obstacles and barriers that were identified but to the initial problem that was identified (D).

(H) Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on the 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, and (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g., reduce, rethink, redesign etc.), please list these as well.

(I) Scalability (replicability): to what extent is the case transferable to other city ‘situations’/environments? Describe whether it is fully, partially, or not scalable and why.

(J) Impact. Please specify if specific indicators such as CO^2 reduction, less distance, reduction of water footprint, number of people reached, etcetera, is used in the cases at hand.

(K) Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of

appearance: (4) value-cascading model (construct revenue model with various constituents), (5) industrial symbiosis (an association between two or more industrial facilities or companies in which the wastes or by-products of one become the raw materials for another. If any other circular business models are addressed in the cases, please list these as well.

(L) Explicitly specify which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding, or knowledge.

(M) Website. Please mention if available.

Appendix 4 - Analysis fifteen UAPCE cases

This analysis is based on the fifteen cases as listed in section 2.1.1.1.

Only six cases showed to have circular economy development ambitions beyond the recycling (waste management) strategy. These were Stadslab 2050 (Antwerp, Belgium), LED-light (Kortrijk, Belgium), Buda+ (Vilvoorde, Belgium), Poort Genk (Genk, Hasselt, Houthalen-Helchteren, Belgium), Retuna (Eskiltuna, Sweden) and mini-reuse (Oslo, Norway):

- Of those six, only Poort Genk and mini-reuse Oslo concretely defined which other R-strategies were going to be implemented in the projects itself. For both cases these strategies were *repairing* and *remanufacturing*.
- In Stadslab 2050 (Antwerp, Belgium) various projects experiment with the circular and sharing economy. However, which specific 7R strategies are used is not defined.
- In the business park Buda+ (Vilvoorde, Belgium) project buildings are going to be reused (however, the reuse strategy is not implemented for other material streams yet) and the ambition exists to experiment with making Buda+ a circular business park. Through which strategies and business models this will be achieved is not defined.
- In Kortrijk (Belgium) the project aims to experiment with a circular business model (product-as-a-service: leasing lamps instead of buying them). No other strategies of the 7R list were included.
- Retuna (Eskiltuna, Sweden) (a mall where only 'circular' products are sold) has a strong focus on awareness creation and education. This means products that have been processed by strategies higher up the 7R ladder are sold there, but no material processing takes place in Retuna itself.

Six other projects were aimed at recycling (Circular bio-resources, Oslo, Norway; Lube oils, Endiale, Greece; HCIA, Greece; Olive oil mills, Greece; Wcycle, Maribor, Slovenia; Knotweed; Ljubljana, Slovenia). The three remaining cases (Bike sharing - Greece, Moschato; Bee Path - Slovenia, Ljubljana; and Green Chains - Slovenia, Ljubljana) appeared not to be actual CE projects, but displayed more general sustainable development projects (particularly in the areas of tourism and rural development) with less focus on circularity. Based on this information provided by the cases it was concluded that concrete projects and action further up the 7R ladder appears to be still uncommon.

Moreover, the analysis of the cases revealed that several of the 're-strategies' used are based on different interpretations, or are not used at all:

- The first strategy of the 7R's format is *refuse*. However, the cases show that this definition is barely used (not one of the fifteen cases included the term). On the other hand, *reduce* is mentioned as a concrete ambition more often (in five of the cases). The same pattern appears in the City Guides/ Circular Economy Development Plans.
- Another 're-strategy' that is not part of the primary 7R's but that occurs often is *recovery*. The term is applied in various meanings: (1) to describe the recovery of materials from physical items (such as buildings, electronics); or (2) to describe the

recovery, redistribution and reuse of flows like heat and nutrients. However, in the first variation recovery is very similar to *remanufacturing* (when new products are made from elements of the same but discarded/ broken products) and *recycling* (when elements are recovered to be used in other products - either of higher value (upcycling) or lower value (downcycling)).

- The harvesting or collection of organic materials with the intention of upgrading it into another product is sometimes defined as reuse. However, this term implies that a product or material is not changed but reused (somewhere or by someone else, for instance) as a whole. When organic material streams are processed into another product of higher value this is argued to be better defined as *upcycling* (part of the last 7R strategy - recycling).

Identified governance interventions

The core of this analysis was aimed at identifying a preliminary list of barriers/obstacles faced by cities in the transition towards a circular city to be able to identify and describe possible actions/interventions to address and resolve these. The focus is on interventions that can be executed at the city level. Hence, several of the interventions here are more applicable to the national or to the research level.

Despite the fact that the empirical evidence from the cases did not cover the full range of items and strategies, some barriers/obstacles and governance interventions were identified. These are listed below, including the Urban Agenda domain to which they apply (better knowledge, regulation, funding):

1. ***Better knowledge*** - The cases show that the range of interventions used is very diverse. Very few actions were an explicit answer to barriers identified within the circular projects. It is assumed that there is a need for a coherent overview of 'circular governance interventions'. This framework can be used by cities to base their governance interventions on, ideally adapted to the specific strategy (or strategies) that are being implemented.

2. ***Better regulation*** - Especially for circular projects in which strategies higher up the 7R-ladder are pursued (strategies beyond recycling, particularly found in the cases of Oslo Community Centre and Eskiltuna), but also for waste processing cases (such as Oslo Bio-waste, WCycle and Ljubljana Knotweed), the legal status of the material/asset flows used is crucial. By legal status is meant the resource status ‘waste’ is given. This status is what makes-or-breaks the potential for innovative use or transformation of materials. Hence, to allow for a transition to circular cities it is essential to reconsider current legal barriers when it comes to e.g. food waste, building material and/ or heat that obstruct innovative use of materials/ flows.

3. ***Better regulation*** - Related to point 2, an intervention that can be implemented on a shorter notice is the instalment of 'experimentation zones'. Within these experimentation zones current rules and regulations are not applicable or not complied, allowing for far-reaching experimentation and innovation. Stakeholders can start experimenting with materials flows and resource streams without having to wait for top-down legal alterations.

4. Better knowledge - For a number of the cases (e.g. Oslo Bio-waste, Eskiltuna and Ljubljana Green Change), low public awareness and participation was described as one of the core barriers for the development of the circular economy in cities. Increasing public acceptance and use of the projects were often also included as 'governance actions'. One of the ways to increase public awareness and participation is to work towards a city-wide basic knowledge level about sustainability (and specifically the circular economy, as can be observed in e.g. the cases Vilvoorde, Eskiltuna, and Ljubljana Green Chains). This means cities would have to pursue a dedicated educational policy aimed at including the topic of sustainability (and potentially the circular economy) across a whole range of educational systems within the cities environment. It would be even better if this could be embedded in primary and secondary education, and also in higher education such as universities and informal institutions but these systems are out of reach for the cities.

5. ***Better knowledge*** - Many cases (Poort Genk, Oslo Community Centre, WCycle, and Ljubljana's Bee Path and Green Chains) addressed the need to ensure cooperation and coordination of projects participants, as well as the necessity of a 'driving force' to keep innovation high. This was solved by all above mentioned cases through the instalment of a long-term coordinator, in the form of a person or entity, with substantive knowledge of the circular goal pursued and sufficient connections to local partners and civil society. In none of the cases the municipality itself acted as the coordinator, but a new or existing, non-municipal person/ entity was installed.

6. ***Better regulation*** - The last intervention that can be deduced from the cases is based on circular procurement (as pursued in the case of Kortrijk). By deciding to pursue procurement demanding (at least a certain level of) circularity) instead of procurement only based on price, municipalities can act as a launching customer and facilitate demand, which is specifically important in the phases when new innovative companies have recently entered the market. This does require the application of budget to be able to cover the expected extra costs of circular procurement. Looking at long-term savings (economically and in terms of sustainability) can help to endorse the shift to circular procurement.

Appendix 5 - Internet case database

Supplementary table 1. Overview of cases collected

Country	City	Name of project
Austria	Region Schladming-Dachstein	Das Genussmobil
	Vienna	BauKarussell
	Vienna	ParaDocks
	Vienna	Wiener Tafel
	Vienna	Green.Building. Solutions
	Vienna	Energie & Reparaturcafé
	Vienna	FragNebenan
	Austria (registered in Vienna)	United Against Waste
	Austria (registered in Vienna)	Handyrecycling
	Vienna	R.U.S.Z
	Retznei	Geocycle
Belgium	Antwerpen	Tapazz
	Gent	Fietskeuken
	Gent	RoofFood
	Kortrijk	StartersLabo Etno
	Gent	Ohne
	Sint Truiden	Kasteel Nieuwenhoven
	Antwerpen, Brussel, Gent, Amsterdam	Parcify
	Antwerpen	REstore
	Gent	EnerGent cvba
	Gent	Cleantech Cluster Regio Gent
	Kruishoutem	Stokstroom
	Brussel	Cradle to Cradle platform
	Gent	De Nieuwe Dokken
	Leuven	Warmtenet Vaartkom
	Gent	Watt Factory
	Brussel	BEES-Coop
	Kortrijk	?
	x	Reburg
	National	Vlaanderen Circulair
	Genk Hasselt Houthalen-Helchteren	Poort Genk

	Antwerpen	Stadslab2050
Bulgaria	Northwestern Bulgaria	"Cleantech Bulgaria" Cluster
	Sofia	Sofia Urban Challenge
	Sofia	"Separately collected batteries in Sofia"
	Sofia	"Hrankoop"
	Sofia	Sofia Green Capital
	Sofia	Member of cities in transition
	Sofia	Member of circular europe network
Croatia	Country-wide	Regulations on Packaging and Waste Packaging
	Country-wide	Naviku Usvojimo
	Krk	Smart Island
	Dubrovnik	Smart Street Dubrovnik/ Smart City Dubrovnik
	Dubrovnik	Steora
	Zagreb	Kliconoša
	Vojnic	Bogata Suma
	Koprivnica	Smart compactors
Czech Republic	Prague	Prazelenia
	Prague	Prague thrift store
	Global (but mainly EU)	Triangulum
	Prague	Furniture reuse centre in Prague
	national	Arnika –municipal waste management
	NAtional	NANOBIOWAT –wastewater treatment with the use of bio and nanotechnologies
	National	Smart cities concept in the Czech Republic
	National	Hithit
	Vinohrady	Bezobalu
	Prague	Zdrojovna
	Prague	Rekola
Denmark	Copenhagen (but reproduced to other cities in Denmark)	(Cycling:) The fast way forward

	Copenhagen	Integrate the transport in your city / Giving integrated public transport the green light
	Copenhagen	Turning the tide in your harbour / The harbour turns blue
	Copenhagen	Make your water drinkable
	Copenhagen	The right climate for wind
	Copenhagen	A city without waste but full of resources
	Copenhagen	Switch on district heating
	Copenhagen	Keep your city cool
	Copenhagen	Build and retrofit the sustainable way /Creating buildings for life
	Copenhagen (Dropped this project; no circular theme)	Urban Planning: Economic and Social benefits
	Copenhagen	Copenhagen - Carbon neutral by 2025
	Kalundborg	Industrial Symbiosis
	Odense	Member of Circular-europe-network
	Odense	Paper waste collection
	Odense	Civic Amenity Sites
	Odense	Hazardous waste collection
Estonia	Tallinn	Sustainable Development Forums
	National	ELMO
	Vana Narva	AS WeeRec
	National	The Estonian Waste Management Association
	National	Association Humana Estonia
	Paldiski	Pakri Science and Industrial Park
	Tartu	Baltic Biogas Bus
	Rae Vald	Lilleoru
	Tartu	LOOMING eco-hostel
	National	Estonian Smart City Cluster
	Near Tartu	Kaveri Kogukond
Finland	Helsinki	Eco-Viikki
	Helsinki	Rebuilding of Jätkäsaari, former harbour site
	Helsinki	Rebuilding of Kalasatama, former harbour site
	Helsinki	ResQ Club
	Helsinki	Tripla
	Helsinki and Jyväskylä	Grano and Touchpoint
	Jyväskylä	Circwaste

	Jyväskylä	Resoure Wisdom
	Espoo	Espoo Innovation Garden
France	Paris/ Triangle de Gonesse	Europa City
	Paris	Green hand charter
	National	Manger c'est bien, jeter ça craint:
	Bordeaux	Territorial Climate, Air and Energy Plan:
	Paris, but planning to elaborate	Freegan Pony:
	Paris	AgroParisTech:
	Bordeaux	CICO Textile
	Eure, near Paris	GEBETEX Tri Normandie
	-	The Third Industrial Revolution
	Forest-sur-Marque	Pocheco
	Lille	TAST'in FIVES
	Paris	Recovery Plan
	Paris	Vélocip'aide
	Paris	La REcyclerie
	Paris	Art against urban waste
	Near Clermont-Ferrand	Eco Chateau de Cautine
	Near Toulouse	Peace Factory
	Near Toulouse	Ecovillage Sainte Camelle
	Near La Rochelle	SCI du Tournesol
	Paris and surroundings	la Métropole du Grand Paris
	Paris	La Bricolette
	Montreuil	La Collecterie
	Barbés, La Chapelle	Civic Lab
	Paris	La Petite Rockette
	Rouen	Zéro déchet Rouen
	Nancy	Zero Waste Nancy
	Strasbourg	Zéro déchet Strasbourg
	Grenoble	Zéro déchet Grenoble
	Corsica	Zeru Frazu
	National	HOP
	Nantes	PIROUETTE
	Alfortville	J'aime Le Vert
	Pantin	ENVIE
	Massy, Ile- De - France	Recyclerie Sportive
	Aquitaine	API'UP

	Montreuil	WiiTHAA
	Paris	Love Your Waste
	National	Zéro Gâchis
	Paris	RecyclLivre
	Lyon	Zéro Déchet Lyon
	Piossy	Recycl'Action
	Toulouse	Recyclo'Bat
	National	Disco Soupe
	France	Refer
Greece	Athene	Easybike
	Athene	SynAthene
	Athene	Innovathens
	Athene	icycles for the whole of Budapest
	Moschato- Taurus Municipality (Athene)	The Public Bicycle Sharing System
	Athene	Endiale
	Athene	Poly Garden city - Athens-micro-climate city
	Athene	Exarcheia Park
	Athene	Urban (Roof) farm of Konstantinos Zarbis
Hungary	Budapest	Cargomania
	Budapest	MOL BUBI
	Budapest	FUTAR
Germany	Berlin	Refoodgee
	Germany (but registered in Schwetzingen)	United against Waste
	Munich & Hamburg	City2Share
	Munich	Civitas ECCENTRIC
	Germany (but registered in Berlin)	Nebenan.de
	Frankfurt	Frankfurt Spart Strom
	Germany (but registered in Köln)	PAPACKS
	Germany (but registered in Berlin)	.hikk offensiv
	Köln	Radbonus
	Dortmund	Zweitsinn
	Rostock	Veolia's bottle-to-bottle recycling
Iceland	Hellnar	The Snaefellsas Community
	near Reykjavík	Sólheimar eco village

	Reykjavik	Better Reykjavik
	Iceland, but based in Reykjavik	Icelandic Recycling Fund
Ireland	Dublin	WeShare
	Dublin	Smart Bins
	Dublin	Croke Park Smart Stadium
	Dublin	Rediscovery Centre
	Cloughjordan	Cloughjordan Ecovillage
	Ireland	Ecooutfitters
	Ireland	Community Re-use Network Ireland
	Ireland	Irish Recycled Products
	Dublin	UPcycling Project
Italy	Marche	La Magione Ecovillage
	Milan	Piuarch Rooftop Garden
	National	SHARE
	National	Enjoy
	Global Market	TOMRA sorting Solutions
	Milan	Sustainable Urban Mobility Plan
	National	FI – Cooperazione Finanza Impres
	Trecastelli, Turbigo, Roma	La Città della Luce
	Rome	Roma Makers
	Rome	Cittalia
	National	Law change
	Parma	Zero waste Parma
	Contarina	Zero waste Contarina
	Capannori	Zero Waste Capannori
	close to Bologna	il popolo elfico
	Close to San Marino	La Città della Luce
	Near to Florance	Il Pollaio del Re
	National	“Towards a Circular Economy with Zero Waste”
	European - national	SCOW
	Milano, Roma, Pellezzano	Consorzio Comieco
	Emilia, Romagna	Rete Regionale Rifiuti Zero Emilia - Romagna
	Armerina	PIAZZA verso Rifiuti zero
	Franciacorta	Progetto Rifiuti Zero Franciacorta
	National	Pifiuti Zero Pesaro Urbino
	Calabria	Pifiuti Zero Reggio Calabria

	Brembate	Rifiuti Zero Brembate e Grignano
	Pisticci	Pisticci Zero Refiuti
	Lamezia	LAMEZIA RIFIUTI ZERO
	National	Rifiuti zero Candiolo
	Parma	FRUTTORTI DI PARMA
	Formia	Formia Rifiuti Zero
	Foggia	Capitanata Rifiuti Zero
	National	Movimento Legge Rifiuti Zero per l'Economia Circolare
	Sicilia	Associazione Rifiuti Zero Sicilia
	National	Italian Climate Network
	NAtional	Fare Verde onlus
	Pontedera	Legambiente Valdera
	Milan	FIAB
Latvia	Malpils	Biowaste treatment by vermicomposting
	Olaine	Sia Nipon
	Jelgava	Fortum Biomass Plant
Lithuania	Wilna	Green Packaging and Technological Process Innovations in Akvavita
	Klaipeda	Fortmun Biomass Plant
	Vilnius	BaltCap Infrastructure
	Vilnius	DanPower
Luxembourg	Ville de Luxembourg	Hollerich Village
	National	Neobuild
	Belval	Sustainability of Belval and Large Urban Projects
	Luxembourg / Wilz / Paul Wurth / Esch	EcoCities
	Smart-cities	
The Netherlands	Amsterdam	Bundles
	Alkmaar	Bodemwasinstallatie van HVC Groep
	Haarlem	Nederlands Hout
	Groningen	Van Hulley
	Enschede	DENIMTEX
	Utrecht	Gerrard St.
	Den Haag	Yespers
	Nederland	GreenWheels

	Geleen	Quality Circular Polymers
	Rotterdam, Amsterdam,Utrecht en Amersfoort	Cirkelstad
	Amsterdam	Zero Waste Lab
	Arnhem	Hamwells e-shower
	Hoofddorp	Park 20|20
	Rotterdam, Amsterdam, Utrecht en meer	Hubbels
	Amsterdam	The Mobile Factory
	Leiden, Amsterdam en Oppenhuizen	Finch Buildings
	Venlo	Circulair stadskantoor gemeente Venlo
	National	Logge Circulair
	National	Green Deal
	Kerkrade	SUPERLOCAL-project HEEMwonen
	Amsterdam	Circle Economy
	Apeldoorn	Rapid circular contracting renovation borough 'de Parken'
	Enschede	Circular coffee in the city of Enschede
	Haarlemmermeer/ Hoofddorp	Meermaker
	Amsterdam	Circulair Buiksloterham
	Amsterdam	Rainbeer
	Amsterdam	The Waste Transformers
Norway	Oslo	Scandic Vulkan
	Oslo	Losæter
	Fornebu	Fornebu
	National	Circular Economy Poland
	National	Fretex
	National	Renas
	Stavanger	EDIBLE STRAVANGER EAST
	Oslo	The Fjord City
	Oslo	The urban ecology programme
	Oslo	Circular Bio-resources in Oslo
	Oslo	Mini-recycling stations and re-use community centre
	Near Trondheim	Camphill Community: Vallersund Gaard
	Bergen	ZERO WASTE NORGE
Poland	Warsaw	International project: "Building Efficiency Accelerator"
	Warsaw	Member of cities in transition

	Warsaw	Member of wriross cities
	Poland	Member of Cecop
	Sosnowiec	"CLAiR-CITY"
Portugal	Lisbon	"Beautiful People Eat Ugly Fruit" / FrutaFeia
	Portugal	Smart Cities Portugal
	Aveiro	"CLAiR-CITY"
	Global Project (Circular Smart Grid amongst countries and cities)	http://dream-go.ipp.pt
	Porto	Member of circular europe network
	Lisbon	Member of circular europe network
	Lisbon	Member of cities in transition
	Portugal	Member of Cecop (unclear what local cities participate though)
Romania	Bucharest	Building efficiency accelerator
Slovak Republic	Bratislava	Big Belly Solar Bins
Slovenia	Ljubljana	Upgrading of Regional Waste Management centre in Ljubljana
	Ljubljana	Zero Waste
	ljubljana	ImpactPaperec
	Ljubljana	refurbish public building
Spain	Barcelona	Fertilecity
	Madrid	Ecoembes
	A Coruña	Closing the Loop
	Valencia	Fissac
	Madrid	Mercado
	Madrid	Slow fashion next
	Gipuzkoa	Zerowaste Europe
	Madrid	Basurama
Sweden	Gothenborg	Göteborg Energi
	Växjo	Sandvik Plant - VEAB Växjo Energi
	Malmö	The waste to energy plant
	Stockholm	Kungsbrohuset
	Stockholm	Symbiocity
	Stockholm	Fjärilstak och nektarrestaurang vid p-däck

	Gothenburg	FED: fossil-free energy district
	Molkom	Ängsbacka
	Norrköping	Fiskeby Board AB
	Helsingborg	Industry Park of Sweden (IPOS)
	Eskilstuna	ReTuna
	Stockholm	Långholmen Hotel
	Stockholm	HOffice
	Stockholm	Hammerby Sjöstad
	Stockholm	Sweco
	Sundsvall	Grönt boende
	Holmsund	Hybricon Arctic Whisper (HAW)
	Gothenburg	ElectriCity
	Umea	Green Zone
	Helsingborg	Öresundsverket
	Bålsta	?
	Ronneby	Cefur
	Gothenburg	Green Gothenburg
	Simris	?
	Gothenburg	Alelyckan Re-use Park
	Malmö	Fullriggaren
	Linköping	Linköping biogas plant
Switserland	Zürich	2000-Watt Society
	Zürich	Public transport Zürich
	Zürich	Fernwärme Zürich
	Zürich	Dubbed Aquasar
	Bern	Repair Café
Ukraine	Kiev	Kyiv Farm
	Kiev	Kyiv Smart City Hub
United Kingdom	Manchester	Triangulum
	Manchester	SmartEcoCities
	Leeds and more	Real Junk Food Project
	Peterborough	Peterborough Reuse
	Bristol	The Bristol Bike Project
	London	Southwark District Heating system
	Glasgow	Glasgow's approach to the Circular Economy

	London	The Paint Place (Forest Recycling Project)
	London	Give or Take (Forest Recycling Project)
	London	Green Office (Forest Recycling Project)
	London	District Heating Manual for London
	London	Kingston University

Appendix 6 - Analysis ten selected cases from the database

Supplementary table 2. Baukarusell

A	City and country	Vienna, Austria
B	Name of the project	BauKarussell
C	When was the project initiated (year)? What is the actual status (still operating or stopped, if so, when and why?)?	Pilot phase on-going (2016 – 2017), second phase due to begin in 2018
D	Circular objective: What is the (central) problem or ambition addressed in the case? Provide a brief description of the circular actions planned/ implemented.	The aim of this project is to re-use building materials of demolished buildings in newly constructed buildings in Vienna. At the same time, through the project, socially disadvantaged persons are being qualified and trained by social enterprises to improve their integration into the job market.
F	(Governmental) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories of lack of funding, lack of appropriate legislation, and lack of knowledge with one or more of the stakeholders (D).	The project is driven by legislation (recycling act) that states that building materials during demolition should at least be left in the same state as before the demolition. Construction material demolition companies are obliged to identify potentials for re-use of building parts/materials and ensure that when there is a demand for such materials/parts on the market, they are extracted in a way that do not hinder or jeopardize their re-use. It does not however oblige them to extract materials where there is no demand or to take on the cost of extraction of the building parts/materials, which needs to be paid by the market.
G	Governmental action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions have been taken to overcome identified obstacles (in the governmental themes of funding, knowledge, regulation) (F). Note that, in some cases, the governmental actions that are described do not relate to the obstacles and barriers that are identified but relate to the initial	Policy/strategy: Specific national legislation on C&D waste management and prevention aimed at enabling and encouraging construction materials' re-use in Austria. Funding/financing: Co-funding of a pilot-project by the Municipality of Vienna. The project coordinator could not name a specific number but a few million euros at the least. This was one-time funding to get the project going. In its second phase (2018), the project will continue receiving financial support from the Austrian Government.

	problem that are identified (D).	The funding measure of a pilot measure is expected to lead, in particular, to better knowledge amongst the stakeholders involved.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies based on the 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g., reduce, rethink, redesign, etc.), please list these as well.	Re-use
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	Technologies and skills are easily replicable in other cities and towns. Scalability potential is significant, however, it is currently limited by a reduced market demand. Knowledge institutes can take the method of re-use, transfer the knowledge to, e.g., students, and ensure these types of projects are executed all over the world.
J	Impact. Please explicate if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached, etcetera, is used in the cases at hand.	During the first phase of the project, Waste reduction: 450.000 kg of C&D wastes from the demolition of an industrial building (Coca-Cola building) were avoided through the project, equivalent to around 1% of the total C&D waste generated. Job creation: new jobs created particularly in low-skilled labour market. Future predictions are that BauKarussell could increase material re-use to 10% of building parts within a few years. By doing this, 9000 new jobs will also be created.
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), and, in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular	Reverse logistics model

	business models are addressed in the cases, please list these as well.	
L	Explicitly specify which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding, or knowledge	Regulation and funding
M	Website. Please mention if available.	http://www.repanet.at/baukarussell/

Supplementary table 3. De Nieuwe Dokken

A	City and country	Gent - Belgium
B	Name of the project	De Nieuwe Dokken
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	2014, still running.
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	De Nieuwe Dokken is a residential area. DuCoop is a cooperation that has several initiatives in the new district 'De Nieuwe Dokken'. The 'De Nieuwe Dokken' site will use waste water and organic waste to produce biogas and fertilizer. These will be used to generate energy for the citizens and fertilize the green parts of the site. District heating is used to spread the energy. Also, 8 electrical cars are available for citizens to share.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	Citizens, municipal utilities, cooperation, local business

F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	Funding, the city of Gent offers subsidies for citizens that work together with companies on district heating. The subsidy is used to hire an expert, who will help with the project. Public awareness building, Gent has a project called ‘Gent klimaatstad’, which is focused on creating an energy neutral Gent in 2050. This initiative promotes all sorts of sustainability.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	Reduce, upcycle
I	Scalability (replicability): to what extent is the case transferable to other city ‘situations’/environments? Describe whether it is fully, partially, or not scalable and why.	The transformation of organic waste into biogas is highly scalable, as it is already done elsewhere, and organic waste is produced by citizens everywhere. The cooperation with a nearby company that delivers waste heat is more difficult to scale. It requires some industry near the city, which is not always the case.

J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	1/3 of the heat will be generated by the waste of the citizens.
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Reverse logistics model, because waste is upcycled into biogas. Value-cascading model, because there is a cooperation between the citizens and the company Christeyns. E.g. waste heat from Christeyns is used for the citizens and waste water from the citizens is used by Christeyns.
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Funding, knowledge
M	Website. Please mention if available.	http://ducoop.be/initiatieven

Supplementary table 4. Copenhagen Carbon Neutral

A	City and country	Denmark - Copenhagen
B	Name of the project	"Get your city carbon neutral"
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	2011, still running (and will be until 2025)
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	Ecological city planning, making sure that every emission of CO2 is levied by an action that uses CO2. This can be viewed as a circular process.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education),	The entirety of the municipality of Copenhagen, including all of its businesses, citizens, municipal utilities etc.

	media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	
F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	Criticism on the development plans from a variety of stakeholders with contradicting views
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	The municipality and government have deployed teams with knowledge that can assist projects in the municipality of Copenhagen. The government also actively funds (new) projects to achieve the goal. The government and municipality also have projects on their own. And they've created a new policy with new guidelines to follow for several area's (construction, waste management etc.).
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	Refuse, recycle, reduce / compensate.
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	The actions that were taken to achieve the goal are not only fit for Copenhagen. Some of the smaller projects have the prerequisite that the city is near a (flowing) body of water though. Since almost all cities are near such areas it's transferable to almost all other cities and environments.
J	Impact. Please specify if specific indicators such as CO2 reduction,	The entire city of Copenhagen carbon neutral by 2025 is quite a feat. No figures were found

	less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	on what the emissions were at the start of the project.
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	-
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Generally, regulation combined with funding, but also knowledge (though on a smaller level).
M	Website. Please mention if available.	Before (at start of project): www.cphcleantech.com/cph-2050 Has become: https://stateofgreen.com/en/profiles/city-of-copenhagen/solutions/copenhagen-carbon-neutral-by-2025 https://international.kk.dk/artikel/carbon-neutral-capital

Supplementary table 5. Green Hand Charter

A	City and country	Paris, France
B	Name of the project	La Charte Main Verte
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	2016
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	The city and its partners have made 47 sites throughout Paris available to grow plants and vegetables in the heart of the capital. The main ambition of this project is to turn unused grounds into urban gardens. A shared garden is an experimental ground for environmentally friendly practices. It participates in the maintenance of biodiversity in urban areas and the development of a plant presence in the

		city, which is part of the sustainable development approach initiated by the municipality.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	Citizens, municipality. But also education on site, so are knowledge institutes involved? Owners of the ground? Or is this the municipality?
F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	-
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	Funding/financing, making land available for urban gardening practices. The Green Hand certified gardens are part of the network of shared gardens run by the City of Paris. The associations thus benefit from exchanges and documentation, and receives information and advice: • methodological support, which helps them to develop and implement their project. • a convention of occupation and use for gardens that are located on the land area of the City from Paris. • technical expertise and advice on environmentally friendly practices and practices eco-friendly accommodation adapted to Paris. • a specific animation: gardening lessons, barter, newsletters, conferences. The garden can be associated with events organized by the city such as the Garden Festival
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4)	Reuse of land, refurbish of land by making it a garden, reusing the rainwater for the garden.

	refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	Is now city-wide, but could be implemented in other cities. It is fully replicable.
J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	The greening of urban environments has many benefits. By providing a refuge for wildlife, helping with soil and air quality and promoting biodiversity, urban agriculture presents considerable advantages for bring nature back into cities and improving living conditions to city dwellers. Additionally, increased green space provides a natural outlet for the absorption of CO2 emissions, helping to combat the problem of climate change caused by greenhouse gas emissions. Moreover, it leads to a reduction of the water footprint when consuming locally produced food (which also uses recycled water), reaching people and making them aware of food production and the benefits of locally produced food
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Sharing model (Sharing of the gardens)
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Knowledge, funding
M	Website. Please mention if available.	https://api-site-cdn.paris.fr/images/123236.pdf https://foodtank.com/news/2014/08/ten-urban-

		agriculture-projects-in-paris-france/ http://frenchfoodintheus.org/3078

Supplementary table 6. La Metropole du Grand Paris

A	City and country	Paris, France
B	Name of the project	La Métropole du Grand Paris
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	2016, still running
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	Its main objective is the sustainable development of the region's economy and employment with a view to maintaining and even strengthening, the Greater Paris position among the most attractive global cities. A circular economy working group has been set up and brings together 10 elected officials and several representatives of companies and eco-organisms. It aims to impulse, animate and maintain the metropolitan dynamic of circular economy. In addition, a metropolitan network circular economy has also been put in place. This network, more commonly known as G142, brings together for all 131 communes and 11 EPTs, a referent elected and a technical referent. This instance will be a place awareness, training and sharing of good practices in the territory of the Metropolis. Then by next autumn, the Metropolis will launch the collaborative digital platform of the economy circular. This tool will be both a resource centre to manage and share documents, a tool for public awareness and a tool for exchange and linking professionals. Finally, the Metropolis will co-organize with the City of Paris the big event annual circular economy with the ambition to make an international meeting of reference.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	Municipal utilities: the metropolis of Greater Paris. Instances are representative of the metropolitan political balance and the different territories.

F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	-
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	The Metropolitan Investment Fund is established by Greater Paris Metropolis to support the projects municipalities and territories in the areas and the stated priorities of the Metropolis, that is to say in 2016, sustainable development, thermal renovation and economic development. These projects aim to promote the development of the territory and contribute to the reduction of inequalities within the metropolitan area. Instalment of a circular economy working group that brings together 10 elected officials and several representatives of companies and eco-organisms. The instalment of a metropolitan network for the circular economy. This network, more commonly known as G142, brings together for all 131 communes and 11 EPTs, a referent elected and a technical referent. and allows for training, knowledge sharing and awareness creation. The launch of a collaborative digital platform of the CE. This tool will be both a resource centre to manage and share documents, a tool for public awareness and a tool for exchange and linking professionals.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-	Not defined which strategies are going to be pursued exactly

	strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	Hardly transferable, since it supports local projects. The concept, however, of uniting municipal stakeholders in a common purpose, is fully transferable.
J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	In 2016, the Métropole du Grand Paris supported 31 projects located in 24 municipalities and one territory for an amount of € 6.5 million. This fund continues to support many projects in 2017, and the Metropolis will be attentive to what it takes considering the data from the observatory metropolitan area with a view to territorial rebalancing.
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Platform/ sharing models, because the project in itself doesn't carry out projects but funds these and shares knowledge.
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Funding/ knowledge, a combination. Main purpose is funding, but facilitating connections and networks, education and creating knowledge is important as well.
M	Website. Please mention if available.	http://www.metropolegrandparis.fr/fr/content/decouvrez-le-rapport-dactivite-2016-de-la-metropole-du-grand-paris

Supplementary table 7. Better Reykjavik

A	City and country	Reykjavik, Iceland
B	Name of the project	Better Reykjavik
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	2010, still running
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	Better Reykjavik is the most successful example of the use of the 'Your Priorities platform'. It enables citizens to voice, debate and prioritize ideas to improve their city, creating open discourse between community members and city council and also giving the voters a direct influence on decision making.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	Citizens, municipality
F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	-
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	Execute the best projects, funding those, monitoring and enforcement
H	Circular strategy(-ies). Please choose	Not per definition circular although circularity

	from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	could be an outcome of the platform. More an example of how civil society can be included in circular city development processes.
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	The idea of letting citizens making plans to improve the living environment is scalable. The specific projects are place bound.
J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Platform/sharing model
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Knowledge
M	Website. Please mention if available.	http://www.citizens.is/portfolio/better-reykjavik-connects-citizens-and-administration-all-year-round/

Supplementary table 8. Rediscovery centre

A	City and country	Dublin, Ireland
B	Name of the project	Rediscovery Centre
C	When was the project started (year). What is the actual status (still running,	2016, still running

	stopped, if so when and why?).	
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	The Rediscovery Centre is a creative space connecting people, ideas and resources. The centre brings together the skills and expertise of artists, scientists, designers and craftsmen united in a common purpose of sustainability through resource efficiency and reuse. The Rediscovery Centre supports the development of the circular economy and advocates for a more resilient, equitable society. The Centre has four reuse social enterprises Rediscover Furniture, Rediscover Fashion, Rediscover Paint and Rediscover Cycling. These enterprises use waste and unwanted materials as a resource and raw material for new product design. The Rediscovery Centre is based in the newly repurposed Boiler House in Ballymun. The building has been developed as a prototype '3D textbook' a relatively new concept in experiential learning and the first of its kind in Europe. The centre demonstrates best practice building design, construction and operation and defines the building and environs as an educational tool to inspire, inform and lead positive behavioural change with respect to resource management and efficiency.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	- Citizens can participate in circular workshops and buy sustainable products such as furniture and clothing. - Local business can present sustainable products and ideas through the use of the centre. - The municipality and national government
F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the	

	stakeholders (D).	
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	The discovery centre is being funded by the Irish department of Housing, Planning, Community and Local Government. The amount of money remains unknown. Also, the Dublin City Council has given the project €3,6 million.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	Re-use, repair, refurbish and recycle
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	With some local businesses that focus on the circular economy and one team that coordinates this, every city could have such a rediscovery centre of its own.
J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	The impact is unknown.
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular	Reverse logistics model, platform/sharing

	business models are addressed in the cases, please list these as well.	
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Knowledge, Funding
M	Website. Please mention if available.	http://www.rediscoverycentre.ie/

Supplementary table 9. Buiksloterham

A	City and country	Amsterdam, the Netherlands
B	Name of the project	Circulair Buiksloterham
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	2009, still running
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	Buiksloterham, a neighbourhood in Amsterdam, is being built to be circular and carbon neutral. Lots of smaller projects contribute to one big project: 'Circulair Buiksloterham.' Five of many objectives are: - Buiksloterham is self-sufficient when it comes to renewable energy. - Buiksloterham is a 'zero-waste' neighbourhood with a closed material flow as much as possible. - Buiksloterham is rain proof and gains nutrients from waste water. - Ecosystems in Buiksloterham are generated and natural capital is self-renewable. -Functionality of infrastructure in Buiksloterham will be optimised and the local 'zero emission' mobility does not generate harmful emission of CO2.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	- Citizens can live in and contribute to a completely new way of living in a circular neighbourhood. - Local business can present initiatives and help build the circular neighbourhood and therefore make profits and work on their reputation. - Manufacturing industries are needed to provide materials to build such a circular neighbourhood. - The municipality has a supportive, facilitating role
F	(Governance) obstacle(s) (and) (or) barrier(s) that	No governance obstacles have been found based on online documentation.

	were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	The municipality has a substantial role in area development in Buiksloterham. This role includes developing the vision, altering the zoning plan, allocating land in which these circular developments and experimentation is allowed. But also inviting tenders, maintaining contact with developers who want to make a start with developments on their own land, designing and developing the public spaces. The municipality is also responsible for managing the public spaces. Funding: - The sustainability fund: this municipal fund grants low-interest loans for energy projects that will lead to a sufficient reduction in CO2. There is €40 million available. See: amsterdam.nl/duurzaamheidsfonds. - The sustainable initiatives subsidy: partnerships working on sustainable projects can apply for a subsidy. For more information, see: https://www.amsterdam.nl/wonenleefomgeving/duurzaam-amsterdam/initiatieven/. - All organisations, businesses and owners' associations in Amsterdam occupying existing buildings can ask for a free energy scan. That will show them how they can save energy, what the options are for generating energy sustainably, the legal aspects, ways of funding, etcetera. See: amsterdam.nl/duurzaamheidsfonds.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any	With so many smaller initiatives, almost all of the strategies are addressed.

	other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	As this is quite a large project, concerning a complete neighbourhood, lots of knowledge and funds are needed to realise it. Therefore cities with the power, funds and knowledge might copy this idea, but it is not a super easy concept to replicate.
J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	https://buiksloterham.nl/engine/download/blob/gebiedsplatform/69870/2015/28/CirculairBuiksloterham_NL_volledige_rapport_05_03_2015.pdf?app=gebiedsplatform&class=9096&id=62&field=69870 Page 128-132.
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Expectedly some of the smaller companies and projects have circular business models
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Knowledge, Funding
M	Website. Please mention if available.	https://buiksloterham.nl/ https://www.amsterdam.nl/projecten/buiksloterham/circulair-duurzaam/

		https://amsterdamsmartcity.com/projects/circulair-buiksloterham

Supplementary table 10. Linkoping

A	City and country	Linköping - Sweden
B	Name of the project	Linköping biogas plant
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	Started with district heating in 1954, food waste project started in 2012. Constantly innovating and still running.
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	Food waste is collected from citizens with 'the green bag' and local canteens and restaurants. Food waste is converted into biogas. The biogas is used for buses and trains and there are stations for citizens to use biogas as fuel for their cars. Residues are upcycled and used as fertilizer in the farming industry again. Besides they also operate in wastewater treatment and use the residual heat for deliver district heating and cooling and cogeneration.
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	Citizens, local businesses, manufacturing industries, NGO, owned by municipality

F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	-
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	Tekniska Verken is a municipal owned NGO that is responsible for collecting and processing waste and producing electricity. They have done all their promotion themselves and they are supposed to cover their costs themselves. The governance action is thus the setting up of such NGO's that can conduct this work independently of the city administration.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	Upcycle, energy recovery
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	This model is scalable, because food waste needs to be processed in any city. However, it took years to develop this plant, so it might not be scalable on the short term.

J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	Biogas has 7% of the local fuel market. Reduced waste that is incinerated by 3,422 tonnes per year Biogas production of 1,334,580 tonnes per year Reduction of 300,000 tonnes of Carbon Dioxide per year
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Reverse logistics model, because waste is used to produce heat, bio fertilizer and biogas. Energy is recovered and distributed through district heating and cooling.
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Knowledge/ regulation
M	Website. Please mention if available.	https://www.tekniskaverken.se/in-english/

Supplementary table 11. BedZed

A	City and country	London, UK
B	Name of the project	BedZED
C	When was the project started (year). What is the actual status (still running, stopped, if so when and why?).	Conceived in 1997. The project started in 2000, and ended in 2002. Project has been completed.
D	Circular objective: what is the (central) problem or ambition addressed in the case? Brief description of the circular actions planned/ implemented.	BedZED is the UK's first large-scale, mixed use sustainable community with 100 homes, office space, a college and community facilities. Their objective was to enable people to live sustainably without sacrificing a

		modern, urban and mobile lifestyle. The aim was to make sustainability 'easy, attractive and affordable'. • BedZED's zero fossil fuel heat and power ambition • Sustainable travel and transport • Sustainable water • Sustainable materials and products - greener construction • Built-in community and a broad social mix
E	Stakeholder(s) involved. Please choose from a combination of the following: citizens, local business, manufacturing industries, municipal utilities, knowledge institutes (including academia/education), media, civil society/NGOs. Please add if in a specific case other stakeholders are involved.	PARTNERSHIP Bill Dunster Architects Arup BioRegional Development Group Peabody Trust Gardiner and Theobald Other stakeholders: City, Citizens, local business, NGOs
F	(Governance) obstacle(s) (and) (or) barrier(s) that were identified during project execution. These obstacle(s) (and) (or) barrier(s) can be classified in terms of the categories lack of funding, lack of appropriate legislation and lack of knowledge with one or more of the stakeholders (D).	Barriers were financial disincentives to green design particularly in the area of green technology. Government subsidies were needed to apply photovoltaic systems for electricity cogeneration. High benchmarks required ramping up engineering capabilities and addressing costs in the renewable energy sector. However, technical reliability and economic barriers were mitigated by mixed-use development and drawing on other sources of income to subsidize rentals. Qualitative aspects of sustainable design, such as light and airy buildings, sun spaces and private open space seemed to drive an unusual level of private investor interest. Barriers of perceived higher costs were addressed by value adding and encouraging consumer demand.
G	Governance action(s). Please choose from: policy/strategy, regulation/incentives, monitoring and enforcement, funding/financing, tariff collection/taxation, data/knowledge management, public awareness	Subsidizing Government policy: The BedZED project introduced the first legally binding Green Transport Plan as a condition of planning permission. On-site charging points for electric

	building. Check and specify what actions are taken to overcome identified obstacles (in the governance themes of funding, knowledge, regulation) (F). Note that some in some cases the governance actions described do not relate to the obstacles and barriers identified, but relate to the initial problem identified (D).	cars are available in Sutton town centre BedZED was influential in the genesis of the UK government policy that all new homes must be zero carbon by 2016. This policy has been incorporated into the code for sustainable homes, a voluntary standard which will become mandatory within a few years. There is broad agreement that the detail of these policies need to be made more workable and that we need to make zero carbon and sustainable homes more cost effective. It is important to consider the lessons of BedZED at a time when this policy is being re-examined by the UK government.
H	Circular strategy(-ies). Please choose from (a combination of) the following strategies: Based on 7R's: (1) refuse, (2) reuse, (3) repair, (4) refurbish, (5) remanufacture, (6) repurpose, (7) recycle (up & down-cycling). If any other re-strategies are addressed in the cases (e.g. reduce, rethink, redesign etc.) please list these as well.	Water efficient—Most rain water falling on the site is collected and **reused**. Appliances are chosen to be water-efficient and use **recycled** water when possible. Low-impact materials—Building materials were selected from renewable or **recycled** sources within 50 miles (80 km) of the site, to minimize the energy required for transportation. Waste recycling—**Refuse**-collection facilities are designed to support recycling. So, (1) refuse, (2) reuse) and (7) recycle
I	Scalability (replicability): to what extent is the case transferable to other city 'situations'/environments? Describe whether it is fully, partially, or not scalable and why.	BioRegional developed the OPC concept while building BedZed, Britain's largest carbon neutral community that has become the prototype of all other OPCs that have been built since. So, yes, the project is scalable. It is a prototype for other projects.
J	Impact. Please specify if specific indicators such as CO2 reduction, less distance, reduction of water footprint, number of people reached etcetera is used in the cases at hand.	*Health and happiness* BedZED residents say they know on average 20 of their neighbours by name; the local average is eight *Equity and local economy* Half of the homes are for low cost rent or shared home ownership *Sustainable Water* Water consumption per BedZED resident is about 50% of the London average *Sustainable materials* Just over half of the construction materials by weight came from within 35 miles

		Sustainable Transport BedZED was the first residential location in London to have an onsite car club from the outset *Zero Carbon* We estimate BedZED produces 37% less carbon dioxide emissions from gas and electricity use than an average development of the same size and mix of uses (1) Social amenity • mixed tenure, home type, and occupiers • living and working community activity • urban density community critical mass • proximity to wider community facilities • private open space for homes • sunlight and daylight amenity • air quality and comfort • reduced need for car • local car pool • community-led management • community internet • individual choice for carbon-free lifestyle (2) Financial effectiveness • housing association build costs • affordable / key worker accommodation • high demand for private sale elements • commands margin over market value • planning gain to add development value • live / work to assist business start-ups • links improve public transport viability • addresses fuel poverty • low energy running bills • Internet links: community / local businesses / service

		(3) Reduced environmental impact • zero fossil fuel • 100% renewable energy use • zero heating homes • passive solar heating • PV power for 40 electric vehicles • 50% reduced potable water • on-site ecological water treatment • wind-powered ventilation systems • low embodied energy materials • recycled timber • reused structural steel • urban tree waste bio-fuelled CHP • improved site ecological value • land as a finite resource • bike facilities • recycling facilities
K	Circular Business Models: please choose from one or more of the following: (1) product-as-a-service models (dematerialization), (2) platform/sharing models (optimise functionality), (3) reverse logistics model (life-cycle prolongation of materials/assets), in case of appearance: (4) value-cascading model (construct revenue model with various constituents). If any other circular business models are addressed in the cases, please list these as well.	Reverse logistics model (life cycle prolongation of materials/assets) • Reuse and recycle rain water • Build materials from renewable and recyclable sources • Refuse-collection facilities are designed to support recycling
L	Specify explicitly which of the Urban Agenda EU objective(s) is addressed. Choose from regulation, funding or knowledge	Funding
M	Website. Please mention if available.	http://www.bioregional.com/bedzed/ https://www.cibse.org/getmedia/ec1a98e7-9713-4903-81b0-64001456657d/GIR89-BedZED-%E2%80%93-Beddington-Zero-Energy-Development,-Sutton.pdf.aspx

Appendix 7 - Identified barriers and interventions database cases

As described in section 2.1.1.2., ten cases were included in the final analysis.

Supplementary table 12 shows the assemblage of the barriers deduced from these cases. Supplementary table 13 presents the interventions deduced from the cases. The findings are clustered per Urban Agenda theme (better knowledge, better regulation, better funding). Within the clusters, there is no hierarchy in the order of the items. The numbers behind each comment show in which case this was found.

Supplementary table 12. Barriers identified in the cases

Better knowledge
Criticism on the city development plans from stakeholders with contradicting views (3)
Better regulation
Obstructing building and construction legislation (1)
Better funding
Perceived higher costs for non-conventional development (10)
Financial disincentives for intended projects (10) (tax system)

Supplementary table 13. Interventions identified in the cases

Better knowledge
Setting clear vision and ambitions and targets (in the case of projects) (3, 8)
Investing in public awareness and public participation (2)
Setting up new guidelines for the different industrial sectors in the city that direct them towards the urban goal (3)
Deployment of teams with knowledge that can assist the projects in the city (3)
Allowing for experimentation space (4, 8)
Facilitate training, methodological support, technical expertise and advice (4)
Instalment of a circular economy working group that brings together 10 elected officials and several representatives of companies and eco-organisms (5)
Setting up of a metropolitan network group connecting all the various areas, an elected official and technical experts, to facilitate in training, awareness and sharing of good practices (5)

Hosting annual circular economy events with the aim of knowledge creation and promotion [5]
Launching online collaborative circular economy platforms allowing for knowledge sharing and creation, public awareness, documentation and networking facilitation [5]
Setting up citizen platforms where they can voice, debate and prioritise their ideas to improve the city - execute and support those ideas that are best. Executing the best projects, providing funding [6]
Setting up of creative spaces where people can connect, network and share ideas. Allows for co-creation and innovation [7, 8]
Better regulation
Designing of binding local regulations that support the desired transition to the CE (for example, for the construction sector) [1, 3, 10]
Altering the zoning plan for soils to allow for circular land development [8]
Allowing for local innovation by owning NGO's that can conduct projects independently of the city administration [9]
Better funding
Supply initial, one-time funding to get the intended project going [1]
Supply subsidies to innovative projects [2, 10]
Funding new projects that align with the urban goal [3]
Investing in platforms or projects that expand awareness and activity with regard to the CE [7]
Deploy or set up of an metropolitan investment fund to support urban projects [5, 8]
Applying for national government subsidies [10]
Qualitative aspects of sustainable design, sun spaces, light (in the example of buildings) led to an unusual level of private investor interest [10]
Encouraging consumer demand [10]

Appendix 8 - Interviews

1. Programme Manager Circular Economy, Chief Technology Office, City of Amsterdam

2. Chief Strategic Advisor Sustainability and Circular Economy, City of Amsterdam

3. Head of the Waste Management Section in the Environmental Department, City of Dusseldorf

4. R1 Managing Director, Tampere Regional Solid Waste Management Ltd. (Public company), and ***R2***, CEO, Verte Tampere, ***R3***, EcoFellow Ltd., City of Tampere (Tampere circular citizen project) (Finland) (Eco3 Park)

5., EcoFellow Ltd., City of Tampere (Tampere Circular Neighbourhood Project)

6. CEO of Circular Change, Ljubljana Slovenia

7. R1 Bruxelles Environnement - IBGE, Division for Information, General Coordinator Circular Economy, Region of Brussels, and ***R2***, Representative of the Brussels Ministry of Environment

8. Wcycle Institute, Maribor

9. R1, Senior Advisor, Department for Environmental Protection, Municipality of Ljubljana, ***R2****,* Head of the Department for Environmental Protection, Municipality of Ljubljana, ***R3***, Deputy Major, Municipality of Ljubljana, ***R4,*** Sustainable Mobility, Department for Environmental Protection, Municipality of Ljubljana and ***R5***, Project Manager, Snaga Public Waste Company

10. Project Manager at Urban Economy DG - Smart City Unit, City of Milan

11. Manager Food Waste Programme, AMSA Waste Management Milan

12. Department of Energy and Environment, City of Antwerp

13. Policy Expert Climate, Energy and Sustainability, City of Roeselare

Test-interviews:

14. Programme Manager Circular Economy, Province of Gelderland, NL

15. CEO, Metabolic Institute, NL

Appendix 9 - Interview scripts

Interview script 1:

Circular Cities Governance

Interview outline

13.11.2017, Nijmegen

Introduction

Project goal:
Cities are attractive starting points for making the transition to a circular economy. Therefore, as part of the EU Urban Agenda, a partnership has been established that seeks to identify innovative, feasible solutions addressing this topic. One sub-theme of this circular city programme regards the identification of governmental interventions that can help to foster the transition to a circular economy within urban environments.

Interview goal:
Through interviews with people representing cities that are experimenting with the development of the circular economy, the partnership hopes to gain insight into (governmental) barriers that have been encountered as well as potential governance interventions that have been identified (or even implemented) as solutions to these barriers. This information can be used as the empirical foundation on which a list of general governance interventions will be based. In the future, this list could be used by cities aspiring to roll out the circular economy. Ideally, this regards interventions that can be performed by municipal institutions themselves in order to avoid forming a list of solutions that can only be addressed at higher institutional levels. Note that a broad interpretation of governmental interventions can be used not only relating to policy-making but to any actions that are initiated, performed, and/ or supported by the municipality (or other municipal institutions that are responsible).

No disclosure
The interviews will be recorded. These recordings will only be used for the sake of this specific research; no other form of disclosure will occur during or after the interview to any (third) party. Once the research has been concluded, the recordings will be deleted. All of the people involved in the research component of the project have signed a non-disclosure attestation.

Every interviewee will receive a synthesis of the interview afterwards. In addition, a publically available report will be composed based on these interviews and additional publically available sources. This report will be distributed to the interviewees as well. If material from these interviews is used literally and not anonymously (e.g., quotes), permission will be asked in advance.

The estimated interview time is approximately 45 minutes.

Project details

Project commissioners:	Christian Schempp and Jonas Byström, EIB (LU)
Project manager:	prof. dr. Jan Jonker, Radboud University Nijmegen (NL)
Project assistant:	Naomi Montenegro Navarro, Radboud University Nijmegen (NL)
Starting date:	13-10-2017
End date:	23-12-2017

General interview script

Background:

1. Name of the interviewee, city, department, role
2. Relationship to the circular city agenda

Policy/strategic level:

3. Has the city of X adopted a strategy/plan specifically aimed at moving towards a more circular economy? If so:
    a. Who is the initiator?
    b. Who is responsible?
    c. What was your approach to get started with the CE? (Baseline measurement conducted?)
    d. Are there any thematic focuses defined?
        - Circular design/production/construction
        - Circular consumption
        - Circular waste/refuse management
    e. Are any sectorial focuses defined?
        - Construction/building industry
        - Manufacturing industry
        - Services, commerce and retail
        - SMEs
        - Utilities (water, waste, energy)
    f. Does it define specific milestones/targets in time (quantitative/qualitative)?
    g. Does it define a budget and funding sources?
    h. Is information publicly available (e.g., internet)?

Operative level:

4. What projects or actions have you applied to move into to the circular economy? Please elaborate on one or more of those examples:

a. What is the role of the Municipality, e.g., enabler, coordinator, funder, executer?
b. What are the main stakeholders involved, e.g., citizens, local business, manufacturing industries, municipal utilities, knowledge institutions, media, and civil society/NGOs?
c. What is the thematic/sectorial focus? - See questions 3.d and 3.e
d. What are specific governance actions applied in those projects, e.g.:
    - promotion of stakeholder collaboration
    - promotion of innovation/knowledge development
    - regulatory/economic incentives for business development

- regulatory/economic incentives for consumption/waste management
- green public procurement
- public awareness/knowledge dissemination/education?

e. Which of these actions is most important/of highest influence and why?
f. Where applicable: particular circular business models promoted, e.g.:
   - product-as-a-service models
   - platform/sharing models
   - industrial symbioses
   - value-cascading models (construct revenue model with various constituents)
   - reverse logistics models?
g. If not applicable: Do you see a role for the municipality to promote such new business models? Why (not)? How?
h. Where applicable: particular circular strategies pursued, e.g.:
   - re-design, refuse, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover?
i. What were/are the main obstacles/barriers encountered? Which one was most important/ obstructing? Provide examples based on the circular initiatives launched so far, e.g.:
   - Lack of awareness/knowledge/data
   - Lack of staffing resources
   - Lack of stakeholder collaboration
   - Lack of appropriate regulatory framework
   - Lack of funding/financing at different project stages
j. What countermeasures were undertaken to overcome these barriers?
k. What was the effect (intended/ unintended) of the implemented countermeasures, and could you explain why? Which one was most important/effective?
l. Were there any barriers for which no solutions were available? How did you proceed?
m. Was there any noticeable difference in the types of barrier/ measures that occurred in the various phases of the project? (e.g., starting phase regulatory/ execution phase knowledge). Is it possible to specify those phases?
n. Status of the action/initiative/project, e.g.: preparation, pilot implementation, up scaling, interrupted
o. Expected impact and scalability, e.g., individual niche, wider city level, regional/supra-regional level. Regarding implementation: do expectations match outcomes?
p. Is information publicly available, e.g. on the Internet?
q. Any other remarks/ comments worth noting?

Interview script 2:

Circular Cities Governance

Interview outline

12.12.2017, Nijmegen

Introduction

Project goal:
Cities are attractive starting points for making the transition to a circular economy. Therefore, as part of the EU Urban Agenda, a partnership has been established that seeks to identify innovative, feasible solutions addressing this topic. One sub-theme of this circular city programme regards the identification of governmental interventions that can help to foster the transition to a circular economy within urban environments.

Interview goal:
Through interviews with people representing cities that are experimenting with the development of the circular economy, the partnership hopes to gain insight into (governmental) barriers that have been encountered as well as potential governmental interventions that have been identified (or even implemented) as solutions to these barriers. This information can be used as the empirical foundation on which a list of general governance interventions will be based. In the future, this list could be used by cities aspiring to roll out the circular economy. Ideally, this regards interventions that can be performed by municipal institutions themselves in order to avoid forming a list of solutions that can only be addressed at higher institutional levels. Note that a broad interpretation of governmental interventions can be used not only relating to policy-making but to any actions that are initiated, performed, and/ or supported by the municipality (or other municipal institutions that are responsible).

No disclosure
The interviews will be recorded. These recordings will only be used for the sake of the specific research; no other form of disclosure will occur during or after the interview to any (third) party. Once the research has been concluded, the recordings will be deleted. All of the people involved in the research component of the project have signed a non-disclosure attestation.

Every interviewee will receive a synthesis of the interview afterwards. In addition, a publically available report will be composed based on these interviews and additional publically available sources. This report will be distributed to the interviewees as well. If material from these interviews is used literally and not anonymously (e.g., quotes), permission will be asked in advance.

The estimated interview time is approximately 45 minutes.

Project details

Project commissioners:	Christian Schempp and Jonas Byström, EIB (LU)
Project manager:	prof. dr. Jan Jonker, Radboud University Nijmegen (NL)
Project assistant:	Naomi Montenegro Navarro, Radboud University Nijmegen (NL)
Starting date:	13-10-2017
End date:	10-01-2017

General interview script

Background:

1. Name of the interviewee, city, department, role
2. Relationship to the circular city agenda

Policy/strategic level:

3. Has the city of X adopted a strategy/plan specifically aimed at moving towards a more circular economy? If so:
    a. Who is the initiator?
    b. Who is responsible?
    c. How was the work organized internally at the city level during the preparatory phase and later at the implementation stage?
    d. How did the cooperation/coordination between city departments go, and were any particular approaches taken to improve cooperation/coordination?
    e. What was your approach to get started with the CE? (Baseline measurement conducted?)
    f. How were other external stakeholders involved (businesses, citizens, NGOs, academia)?
    g. Are there any thematic focuses defined?
        - Circular design/production/construction
        - Circular consumption
        - Circular waste/refuse management
    h. Are any sectorial focuses defined?
        - Construction/building industry
        - Manufacturing industry
        - Services, commerce and retail
        - SMEs
        - Utilities (water, waste, energy)
    i. Does it define specific milestones/targets in time (quantitative/qualitative)?
    j. Does it define a budget and funding sources?
    k. What sources of funding/financing have the city used/does the city have access to for circular projects and activities (own sources, external public / private sources)?
    l. What obstacles (if any) were encountered in applying for/accessing/using such funding/financing?
    m. Is information publicly available, e.g., on the Internet?

Operative level:

4. What projects or actions have you applied to move to the circular economy forward? Please elaborate on one or more of those examples:

a. What is the role of the Municipality, e.g., enabler, coordinator, funder, executer?
b. What are the main stakeholders involved, e.g., citizens, local business, manufacturing industries, municipal utilities, knowledge institutions, media, and civil society/NGOs?
c. What is the thematic/sectorial focus? See questions 3.d and 3.e.
d. What are specific governmental actions applied in those projects, e.g.:

- promotion of stakeholder collaboration
- promotion of innovation/knowledge development
- regulatory/economic incentives for business development
- regulatory/economic incentives for consumption/waste management
- green public procurement
- public awareness/knowledge dissemination/education?

e. Which of these actions is most important/of highest influence and why?
f. Where applicable, particular circular business models promoted, e.g.:
   - product-as-a-service models
   - platform/sharing models
   - industrial symbioses
   - value-cascading models (construct revenue model with various constituents)
   - reverse logistics models.
g. If not applicable: Do you see a role for the municipality to promote such new business models? Why (not)? How?
h. Where applicable, particular circular strategies pursued, e.g.:
   - re-design, refuse, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover.
i. What were/are the main obstacles/barriers encountered? Which one was most important/ obstructing? Provide examples based on the circular initiatives launched so far, e.g.:
   - Lack of awareness/knowledge/data
   - Lack of staffing resources
   - Lack of stakeholder collaboration
   - Lack of appropriate regulatory framework
   - Lack of funding/financing at different project stages
j. What countermeasures were undertaken to overcome these barriers?
k. What was the effect (intended/ unintended) of the implemented countermeasures and can you explain why? Which one was most important/ effective?
l. Were there any barriers for which no solutions were available? How did you proceed?
m. Was there any noticeable difference in the types of barrier/ measures that occurred in the various phases of the project (e.g., starting phase regulatory/ execution phase knowledge)? Is it possible to specify those phases?
n. What forms of funding/financing or other incentives does the city currently offer to support circular activities or projects (financial contributions in form of subsidies/grants, subsidized rent/land, training/capacity building/advisory services, other) and at what stage (R&D, business planning, investment, operations)?
o. Has the city identified any particular funding/financing gaps/needs that limit the development of circular economy projects and initiatives and, if so, where (in terms of both technical assistance and/or investments)?
p. Status of the action/initiative/project, e.g.: preparation, pilot implementation, up scaling, interrupted.
q. Expected impact and scalability, e.g. individual niche, wider city level, regional/supra-regional level. If further along in implementation, do expectations match outcomes?
r. Is information publicly available, e.g., on the Internet?

s. Any other remarks/ comments worth noting?

Appendix 10 - Interview synthesis

Transcript 10.1

Program manager Circular Innovation
CTO - Office/ Innovation Team
10.11.2017 - By phone

Has your city adopted a strategy specifically aimed at moving towards a circular economy?
Yes, we have. This was initiated by the city government, a decision agreed upon by all deputy mayors. The City of Amsterdam, together with businesses and research institutes from the city, then developed the Circular Innovation Programme (CIP) and, with our own municipal departments, a separate programme called 'Amsterdam Circulair: leren door te doen' (Amsterdam Circular: learning by doing). This was based on the task provided by the city council: stimulate the city as a circular living lab, facilitate the possibility for everyone in the city to experiment with the circular economy.

Are there any thematic/ and or sectoral focusses defined?
We started off with a metabolism scan for the city to understand where the so-called 'low hanging fruits' were. In this scan, we focussed on which sectors in the city would be worthwhile to start most CE innovation in. We registered that we can gain the biggest impact in the Amsterdam Metropolitan Area by focussing on food and construction materials that enter the city in the current system, what happens with these products, and how we deal with them once they have turned into waste. In both chains, there is a lot of room for large-scale changes and making them circular. The City Scan also provided the advice not to approach the CE from a waste but from a chain perspective meaning including logistics, sustainable energy, etcetera, and focussing on innovations that can accelerate the transition. That advice led to the development of the CIP which includes not only technical but also social innovations and which addresses the entire Metropolitan Area of Amsterdam.

Did you specify any milestones or targets?
No, at least not quantified targets. We don't have them yet. However, the national government has decided that NL should be a 100% circular in 2050 and 50% circular by 2025. These targets function as guidance for our CE development.

Were there specific funding sources or budgets assigned?
We do have several funding sources; however, we really want to pursue a circular ECONOMY. This means that we want to figure out how we can use our existing funding instruments and stimulate the transition from there. The first tool that we use to achieve this is through public procurement. Secondly, the city has a revolving sustainability fund of 50 million euros. The projects that make use of that fund have to pay back within 15 years, and the interest is very low. However, we see that it is very hard for innovative circular companies to get money from this fund as this can only be used for funding projects and not funding companies and their business. However, many of the circular innovations in the city are small companies and need funding to build up their business and organization as well.

So this is a mismatch. We are now looking to see if we can use the money from this fund in another way, for example, publishing competitions
Thirdly, we have finance/small subsidies available for research projects which can get max 15 000 euros. But this is for research and exploration and small (neighbourhood) initiatives. We are not subsidizing other initiatives because we really want to stimulate the circular economy by an economic approach and not by subsidizing it.

What kind of projects or actions have you applied to move to a circular economy?
We conduct projects on three different levels. A lot is research and redesigning (3D-printing with domestic waste experiments, for instance). At the second level, we are really focussed at developing new business models aimed at valorisation. As part of this strategy, we made a start-up programme in which innovative start-ups are supported to come up with circular solutions and for which we use procurement to scale up. Thirdly, we look at our own instruments. Which of our own actions can we alter so that it supports the circular economy? The first, of course, is procurement. Another example is the 'gronduitgifte' (land allotment). Now, we use these tenders to demand more circular use of those soils. We have started three of these tenders last year, as an experiment, learning by doing. Relatedly, we are looking at what kind of influence can we have to stimulate and to force the construction sector to become circular. What legal instruments can we alter? This is now being researched so we have not implemented any of this yet.

Moreover, we try to consider waste as a resource. But, unfortunately, national regulation blocks that perspective, and we cannot change that directly. However, to try to overcome this barrier, we have initiated the Circular City Deal: we asked other cities in the Netherlands to join us in writing a document in which we put the main topics for better cooperation between the cities and the national government. Reconsidering obstructing regulation is part of that. This City Deal was signed in 2016 and is currently being elaborated.

What are other important barriers that you encountered while working on the circular economy?
First of all, we all think we know what the circular economy is. But, in the end, we are all talking about something else. The CE definition is still very broad. Ranges from very holistic integrating material use and social innovations, versus interpretations where CE primarily means recycling.
Secondly, part of the CE is far-reaching cooperation throughout value chains. However, people (and companies) are reluctant to share information. Hence, the transparency that is required to move to circular value chains is still lacking.
Lastly, we can't measure the circular economy. We do not have the indicators. For instance, when you want to demand circular procurement, different companies will describe their approach differently, and you cannot really compare them. On a larger scale, it is very difficult to measure the development of our economy. GDP does not suffice if you want to measure how the CE is developing and what effect that has on our society. Yet these are the indicators that we have now.

We are trying to solve the transparency issue, for instance, by looking at technology- what kind of data do you need? What kind of technologies can help to make this data available while allowing companies to feel reassured about the safety of their 'company information'? If it would be possible to use blockchain technology, for instance, that would be a fantastic

development. This kind of research we are working on together with our (knowledge) partners.

Other barriers can be solved within the own organisation. For instance, when we used 3D printing technology, we built new products from waste. Now it is not possible to put these materials in the public space because we still have obstructing public policy on what materials can be used - not matching our CE innovations. So, in this case, we have the opportunity to use our policy to adapt to a circular innovation. On the other hand, cultural barriers also occur: even though we would be allowed to use recycled materials in the urban spatial development, many of the people managing the urban space are not very appreciative yet of not being allowed to use new benches and new materials but being obliged to reuse materials from elsewhere, for instance. This requires more knowledge, more understanding of the necessity of these changes.

Yet, the biggest barrier that we encounter is that every company and every sector that works with the CE is at a very different maturity level. In some cases, companies from specific value chains have never even met each other while, in other sectors or companies, people have been trying to cooperate on CE development for years.

Transcript 10.2

Strategic Advisor Sustainability and Circular Economy

The city of Amsterdam has developed a dedicated circular economy strategy. In 2013, we had a first brainstorm and consultation sessions with market parties on the CE. What is it, and what is the role of the local government? This led to a vision -document on the 'circular metropole Amsterdam'. This was offered to negotiators of the new city government (after the elections). Subsequently, this ambition as outlined in the vision-document got taken up in the coalition agreement (2014). In the beginning of 2015, this was translated into an integrated agenda for sustainability with five transition paths: sustainable energy, clean air, climate adaptation, the own organisation, and circular economy. The circular economy, at the same time, was determined as the umbrella-theme connecting all other themes. We chose to include CE as both a separate as well as the umbrella theme as this allowed us to innovate in the CE path while still developing and making impact in clean air and energy, for instance - not risking insufficient attention for those key themes. Yet, all developments in all paths have to fit with the transition to a CE.

The CE, for us, is a holistic approach defined in our sustainability agenda as including waste as a resource, closed loops, renewable energy, new business models, from owning to using; all these aspects that are related to the CE. We aim to integrate the whole combination of CE-strategies - most definitely not only at the waste management.

In 2015, we conducted quantitative research into the potential of the CE for the urban region by mapping the urban metabolism of Amsterdam (the City Scan). Based on all this data ranked by various economic and ecological indicators such as job creation or CO2 and material reduction, we chose two value chains that showed the largest potential to start developing the CE in. These were the construction and organic residue chains. The fact that we are looking at the value chain level and not specific companies or projects already

illustrates that we aim to include the full spectrum of CE-strategies and not only low-value strategies such as recycling. After finalisation of this scan and route map for the two chains, we presented our outcomes to the market parties to consult them on whether our ideas were correct. The market enthusiastically supported the notions as presented in the city scan which was to be expected as the fact that the city chose to pursue a circular economy was also based on the fact that the market conveyed to be willing to start the transition as well. We could see this at the larger companies such as Philips and the harbour, for instance, but especially also with the smaller companies and start-ups in the city which are often aiming to be circular. Our starting point for this transition is also that companies and citizens are the driver, that we have a clear role to play mainly from procurement power, but that we only facilitate, not push, the transition. We are not going to something that is not supported by the market. So, for our research, we already included a large variety of regional market parties and their data, get to those two value chains. Subsequently, we have expanded this by organising roundtables for both of the value chains to which also residents were invited. Hence, we think it is crucial for cities to do extensive market consultation and cooperation before deciding upon a development strategy so you can really grasp what the best starting point can be. Because, otherwise, you do not know what you base your strategy on. And, once you have your starting point, you can decide what your moon-shot is. Our ambition is to be a frontrunner in the transition. Only then are you able to develop an integrated CE development strategy.

The fact that we want to be the frontrunner means we will facilitate the transition to the CE by all means possible. We, as the municipality, are one of the partners of the transition of Amsterdam; it is not our transition, but that of the whole metropole in which all the players from the metropole are stakeholders. In Amsterdam, there are many innovative companies and relevant knowledge institutes that are essential to help foster the transition; this innovation power is important. If you do not have that as a city, it will make the transition more difficult. However, the fact that we have marketed our desire has also attracted innovative organisations to the city. So, it works both ways. But without clearly expressing *long-term* ambitions, the market will not participate as easily.

The market parties really expressed to us as the municipality that they wanted to cooperate to achieve 'evidential value', Amsterdam is in the starting phase of the transition. This means showing that the CE is reality, that it is viable, cost-effective, and provides a solid business case; not only towards other companies in the value chain but particularly also proving it for themselves. Therefore, we have translated the market consultation and research outcomes into the Amsterdam programme for circular economy, which exits of two pillars. The first is 'Amsterdam circular: Learning by doing', which are only projects of which we as the municipality are the initiator. For instance, demanding circularity through the land allotment (gronduitgifte) or fostering circularity in the development of the harbour-residential area. The second one is the Innovation Programme which is purely the compilation of projects conducted by market parties and knowledge institutes to accelerate the Amsterdam transition to the CE.

We do not work with quantified goals. We only have a qualitative goal, which is the ambition to be the CE frontrunner. But our strategy is to learn by doing - we cannot set quantitative targets because you simply cannot know. This is a completely new transition, the only way to move forward is by doing as there are no right indicators to use or follow. It would be wrong

to suggest that you can live up to targets or measure indicators while you actually do not know. And what do you measure? Because, in the end CE is a means to become future-proof. These are large questions for which no answers are available yet. I hope that, in the next coalition-phase, we are further in the process and can perhaps agree on several steering indicators. But, for now, that is much too early.

Regarding funding, we decided that we had to allocate additional money to be able to conduct research.

In total, we have about 75 projects running of which several are related to circular spatial developments and building - the tenders that we put out for the built environment are circular. Procurement is another important one and, of course, a large share is initiated by market parties. But we are often only slightly involved in these initiatives that are coming from the market and research institutes predominantly by offering the city as living lab. We can then facilitate in data provision, networking, linking parties. And we can use our own instruments such as procurement or a revolving fund to assist these private initiatives as well. But, for instance, also through rules and regulations. We have used the 'crisis and recovery-policy', for instance, which overrules environmental regulations and allows you to, together with the state, spur spatial developments in a faster way. We can skip many extensive procedures that would otherwise obstruct fast implementation of development projects. Relatedly, we are working on a 'maker-area' in the harbour region where experimentation can be supported. Nevertheless, without adjustment of the waste regulations, we can never achieve industrial symbiosis in the harbour area. This is a key barrier.

Another important barrier is that, as long as we do not alter our taxation system, shifting to a circular economy can never be fully achieved. As long as labour is more expensive than primary resources, circularity will remain financially subsidiary to a linear system, and you can never achieve all 7Rs of CE. Moreover, there is no market for secondary materials yet. On the one hand, there is insufficient supply because there is insufficient demand. But, this we can stimulate by procuring/ tendering circularly. Yet, on the other hand, the lack of a market also means that it is very difficult to estimate residual value of a building, for instance. And lastly, circular products are often more expensive because externalities are not internalised in virgin products. In the Netherlands, especially, a lot is decided and set at the national level, meaning, as an urban region, you cannot influence regulatory obstructions yourself. Only lobbying is a tool to influence this.

On the more urban level, we notice that our own financial instruments are not fully adequate. We can only do project financing with the revolving fund we have, however, many circular initiatives need company funding and not project funding. Hence, we are currently consulting with the Rabobank on how we can alter these financial instruments.

But also, we notice that we need to better identify which competences we need within our own organisation to be able to facilitate the transition to the CE. For instance, you need urban designers that can work from the perspective of the urban metabolism; who know how to work from a holistic city vision. Hence, the organisations of CE competence requirements need to be identified and realised. It pleases me to see how often we get requests from

students that are working on a circular project; I think the next generation will be much more used to integrated thinking, which will be of great use.

Nevertheless, we do have to invest in knowledge development still, also with market parties and the national government; it is paramount that we learn to speak the same language. When we are talking about circular spatial developments, every party needs to understand what we mean. This is why, for the specific tool of land allotment (gronduitgifte), we have made the route map together with market parties. This will reduce confusion greatly and ensure we are all on the same page. Within our own organisation, we have, for instance, supplied tickets to public lecture nights hosted by NRC about the CE, which is a very practical solution but helps to spread knowledge amongst our staff. Moreover, we organise ateliers, field visits about all kinds of innovative topics including the CE. Moreover, we have many project managers on a wide variety of municipal departments all involved in the CE programme. This creates integration of CE in all levels and helps to have a contact point within the various departments. This way, you create a movement together through the whole municipal organisation.

In addition, we are going to evaluate our efforts throughout the process. Not only in hindsight but particularly also to identify what the lessons learned so far imply for the focus and future implementation of the programme. These evaluations will be an important knowledge-base for future developments. One of the things that we are definitely going to look at is how you can integrate circular procurement in your budget plans and annual accounts and that you are going to shift your ownership to leasing/ using models. How do you then define value in a budget plan?

To wrap up, circular economy is about a new economy - hence, it is important for cities to foster the transition to not take off from a waste management perspective because that is about optimising your linear system, not shifting to a new one. This is a critical knowledge barrier in many organisations and cities who mainly seem to focus on circularity in the form of optimised waste management. Many cities might think that they do not have the capacity or ability to start with a full, integrated circular approach and, therefore, start from the waste management perspective. But no city does for that matter, because nobody knows how to do it exactly. Learning by doing is key - dare to start with experimenting, yet set a vision first.

A final remark. I think it is important to stress that, from the beginning on, you need to cooperate with the whole range of relevant departments within the own municipal organisation - do not leave it in the environmental department, for instance. And start right from the beginning with cooperating and consulting with market parties and knowledge institutes. We are used to that in the Netherlands but, in many countries, that is not part of the governance system. A shift to collective, open culture is critical.

<u>Additional remarks</u>
By phone, 19.12.2017

- The largest amount of the time spent as coordinator of the circular economy goes to trans-department cooperation. This is crucial for CE development but takes enormous amounts of time.

- The single most important factor for the possibility to move to a CE is support for long-term CE ambitions at the right institutional levels. Without back-up and active support at the political level, CE developments will remain to be non-integrated and muddling around.
- The Circular City Deal is certainly a relevant governance tool to implement, aimed at a broader stakeholder group.
- Financially, we mainly see whether we can spend money that was already going to be spent. In other words, can we reroute financial streams to go from conventional routes to circular investments?
- A very important task for the city is to research what knowledge is available, where this is available, and how this can be connected, but also what the knowledge gaps are for the CE. This means also mapping all available conventional knowledge that is relevant for the CE, for example, on the construction of buildings. When an overview of the available and missing knowledge is achieved, you can work towards a 'CE knowledge agenda' for the city.

Transcript 10.3

Environmental Office, Head of the Waste Management Section

17.11.2017, Live, EUROCITIES Conference

Dusseldorf has no dedicated circular strategy, but there are a lot of instruments that we use to foster circular consumption and production. The key example is the procurement of recycled office paper for the municipality. This has led to an increase of the use of recycled office paper leading to a total coverage of 85% while we started with 27% only in 2014. We collect office paper and sell it to a recycling company. Subsequently, we are then also facilitating the market by buying recycled paper back for use in the offices.

The procurement agenda, for now, is targeting environmentally friendly products - non-toxic, long lifetime, for example. For construction materials, we are now demanding recycled materials (if possible), and some materials are excluded (non-certified tropical wood, for example). These internal regulations are valid for all departments within the municipal organisation including public schools, for instance. In relation to the 7R CE division, we are currently mainly focussed at recycling. We are not going to change this standard very soon because it is a very time-consuming and very expensive procedure - it requires a lot of internal staff time to change these procurement rules.

But, though not concretised as a specific CE strategy, we do touch upon strategies that are also relevant for the CE. For instance, that we demand products that have a long lifespan - which means we need new products half as often as usual. This reduces the amount of materials that you use greatly.

Another strategy that we use to foster our green agenda that is very successful in the whole of Germany and Austria is the OekoProfit programme. This was invented by the cities of Graz and Vienna. In these cities that participate, learning processes for SME's are facilitated, for instance, relating to the European environmental auditing scheme. This is a

very difficult and complex procedure, which for small companies with ten people, is too costly, too difficult to learn. But, when you are ten companies organised by the city, then it becomes possible. Thus, we facilitate in their knowledge capacity by joining them together, allowing them to learn about core topics and from each other. There is also some funding related from German states (North-Rhine Westphalia). Many companies have already joined, greatly reducing the energy consumption, the amounts of waste produced, etcetera. You can use this scheme to let SMEs gain knowledge about important environmental topics, which they can incorporate in their businesses.

As a waste management authority, we control what companies in the city do with their waste. Within the construction sector, it is very important that, when you demolish an old building, you separate all the waste streams very clearly. How this could be done best was an extensive learning process, mainly by in-vivo, active strategy, seeing what these companies are doing, taking probes, looking at what methods work best. Now, we have a very advanced standard for building waste separation.

As a city, we have a strong climate protection programme. We focus at heat, waste, materials, infrastructure, etc.
The biggest barrier now is that we approach this still in an old-fashioned way. We look at it as silos, as separate disciplines. Now is the time to start working on a more holistic approach, but how to do that, we are still learning.

Transcript 10.4

Respondent 1:
Managing Director Regional Public Solid Waste Management Ltd. Company

Respondent 2:
CEO Regional Circular and Biobased Economy Platform

Respondent 3:
CEO City Citizens Involvement Company

16.11.2017

Introduction
R2: Verte is a platform for circular and biobased economy efforts in the region of Kolmenkulma, specifically, the ECO3 project. In the ECO3 area, we develop bio- and circular economies' business and innovations on an industrial scale. ECO3 is a nationally significant competence centre which also runs various demonstrations and pilots. It is an industrial park in which the waste outputs of one company are used as input for the other, a total of 90 hectares. The park includes a nutrient, wood, and technical cycle and is linked to the waste management system of the city of Nokia (2nd largest city in the region of Tampere). The site is a local energy production centre as well in which heat, electricity, and biogas are produced and in which a pyrolysis plant is included for oil, coal, gas, recycled steel (input is rubber tires mainly). At this moment, only one site is free; the rest are all sold.

ECO3 started in 2014. Grounded in the fact that the SWM company already has a platform that could be expanded. How could we create added value in that concept? ECO3 started from these discussions. However, we were already thinking about how we could develop the bio-economy (not circular economy) from 2011 - especially looking at biofuel production. It took three years longer before we set up the cooperation between us three. We asked input from a professor from the Tampere Technical University to help us. Together, we worked on the question of how to work out this idea into an industrial scale business concept. We now have 60 million euros of investments thanks to R1's company, among others.

R1: TRSWM Ltd. is a publically owned company owned by 70 different municipalities. We thus already have a large infrastructure installed from collection to recycling and incineration. This is very important infrastructure that we could use to build the ECO3 on. We wanted to be able to find better uses for the source separated material streams that we get in and attract new and innovative companies that could provide new kinds of solutions.

R3: EcoFellow is a company owned by the city of Tampere. We are working closely with citizens and conducting all kinds of campaigns to get citizens involved in all kinds of circular issues. We are also developing a new CE promotion concept for the city.

What was the key incentive to start developing ECO3?
R2: Finland has decided it wants to become the world-leader in recycling. Hence, the main incentive came from the national government. Then there came a national roadmap for the CE - this shows what kind of actions were needed, what the political visions are, what kinds of needs you have for a circular economy in small and bigger scales.
R1: This helped to start off. Moreover, the Tampere region is both big and small enough to start such a project. Big enough to acquire large enough feedstocks to realise an industrial-scale park, small enough to be a bit flexible.
R3: Yes, and small enough to be a region where people know each other, trust each other, and can work together.

R1: We attracted the other partners that could fit with our infrastructure.
R2: The ECO3 project is a cooperation between a large variety of stakeholders, public, private, and civic society company.
Based on a public company platform. Hence, our project shows that public companies can function as a platform, as an instigator of innovations and CE developments. As long as you share the same ideas and visions, and as long as you are talking about euro' and not only conducting such projects for 'fun'. Moreover, we are not financed by any EU money but pay for it with all participants. Only Verte's money comes from the city of Nokia.
Verte functions as the coordinator, as the 'glue between all participants'. I arrange meetings and align ideas. This is a crucial factor for success. Someone has to own and organise the project, especially with so many partners cooperating, but also to keep the project going, to ensure funding is acquired and allocated properly, and that actions are taken when necessary.
R1: Cooperation is a very important theme. We work together with regional knowledge institutes, the Ministry of Environment, etcetera. We set up a consortium in which everybody is joined together; we meet every second month.

R2: Cooperation works also because there is trust. It is a matter of trust.

R1: Moreover, my company is not trying to make any profit; only so we can maintain and develop our services.
R2: The companies are all aimed at doing 'something more'; they share that vision. They have intrinsic motivation to cooperate and make it work.
R1: And, for now, there are no competing companies. When, in the future, another company wants to join the processes similar streams as other participants also do this might change.
R2: But participants see the cooperation also as an opportunity to develop; and are hence motivated to contribute. Without cooperation, they cannot get the full potential out of the park.

Also focus at other 7R strategy?
R2: No, at this moment, we mainly focus at energy and resource recovery. But you also have to develop in what you are good at; we are good at waste handling - we cannot address all the other topics as well. Specialization is important.

What are the stakeholders involved?
R1: The municipality of Nokia is important; they are very involved and committed. The City Council is behind Verte, and the mayor is a very important driving force - he decided that ECO3 is the key development project in Nokia. The municipality and the participating companies are the key stakeholders.
R3: citizens are not very involved yet.
R1: However, they are important as they are our key workers: they separate our waste flows. In addition, farmers play an important role. They deliver waste and they are one of the key receivers of ECO3 output streams such as nutrients.

Critical barriers?
R1: For now, the trickiest part is to find markets.
R2: Within Finland, this is not achievable as the markets are not big enough. But, fortunately, we have two harbours at about a hundred kilometres, meaning we can ship to Sweden and the Baltic sea region easily. It is an iterative process, seeing where you can put your products and the market and what it needs to look like exactly. You need a crystal ball to be able to be sure. What can be partially solved by working closely with universities, who can help to give insights in where opportunities lie? And regulations can be very helpful. For instance, the government decided that 10.000 cars have to run on biogas within a few years; that is a large opportunity for us and an important reason we are able to build the biogas reactor. This way, markets can be created also. Moreover, we are in constant consultation with market parties to see where the opportunities lie.

R1: Getting citizens to source separate.

R2: EU regulations that obstruct innovative processing of waste have to be lifted, ideally. And, in Finland, for some reason, public institutions have not yet shifted to circular procurement really, very low targets still. Still could be improved.

R1: And, to ensure that material flows do not constantly shift owners: every shift doubles the cost. Processes have to be kept as simple as possible. The industrial park is a lot of players but for the different materials. Thus not many participants for one stream.

Key moments that fostered development?
R1: There was a lot of land available that was previously a landfill that the city of Nokia offered as a suitable location.

Transcript 10.5

CEO City Citizens Involvement Company

16.11.2017

EcoFellow is a company owned by the city of Tampere. We are working closely with citizens and conducting all kinds of campaigns to get citizens involved in all kinds of circular issues. We are also developing a new CE promotion concept for the city.

The city of Tampere is making a new part of the city in a brownfield area, three and a half kilometres of the centre of the city. A lot of contaminated soil and degraded buildings. They are now planning a city-area with about 25.000 people and 10.000 jobs which is going to be based on the circular economy principles. The idea is to work towards an area where we produce more than we consume. We want to close material and other flows as much as possible. The area has to be built with sustainable, recyclable materials, buildings and infrastructure have to be reparable and replicable. We are looking at so many different issues.

Hence, we are now developing the rules that we are going to include to be able to put out tenders for buildings and infrastructure construction, for instance, that are circular. Moreover, we are developing tools through which we hope to not only force the companies but also to invite the companies to develop circular plans. So, we create a situation in which the market does not only feel as if they are instructed to work more circular but that they are also inspired to do so. We are developing this together with market representatives, and the universities are involved as well.

It is still in the starting phase, but we are working on multiple pilots already.

It is a huge project, more than 100 million euros, and it will take a long time. The city will be in charge of building the infrastructure, and pay for that. Moreover, the area is provided for the buildings.

We were looking for examples throughout Europe for how to approach the building of a circular neighbourhood; but there aren't any.

Here again, the participation of citizens is key again. There are many events and initiatives aimed at informing them, getting them involved. Workshops in which they can provide input on the plans and planning and so forth. And it is very popular because the city hereby wants to open the area for the people again as before it had been closed. People can visit it again, people can see it and get more eager to support this development. And even provide pressure to the politicians to proceed these innovations.

But public acceptance of this project is already very high; people are enthusiastic.

Transcript 10.6

CEO Circular Economy Advisory Non-profit

Circular change is a privately owned non-profit based on the role model of Circle Economy in the Netherlands. We started as entrepreneurs who realised that the CE can only be implemented if you engage all stakeholders. It is not reserved for the mayors, for the cities, for the industry only; everybody can and has to contribute. That was the main challenge we saw and wanted to tackle.

Achievements CE:
- Push CE into the vision of the national government and governmental documents (the smart specialisation strategy);
- We are enabling stakeholders to develop in the CE. For instance, if a company wants to become more circular, we invite other relevant stakeholders, as we have the network, and help. This is a form of matchmaking.
- On the other hand, we are promoting best practices and lessons learned within the community of the EMF, the WEF, the Circular, and the European Circular Economy Platform.

Important themes for cities transitioning to a CE:
- The mayor or city council as a whole should put a CE vision first. In only one mandate, a CE transition will not happen. You need a longer-term vision. In Ljubljana, this started ten years ago with a strategy and action plan for Ljubljana. Here, the mayor was really the one who prepared for the transition to a CE.
- When you set goals, you *have* to work on them because things are changing so fast. You need the vision as a guidance but be willing and able to pivot and alter your strategies and not wanting to stick to them.
- Leadership: it is about having a team within the city that understands why you are doing this and that understands that the quality of life of the citizens is key.
- Circular economy has to be holistic - when you implement various projects, you should be aware of this still. Important to keep track of the helicopter view - and implement specific strategies 'on-ground' to reach that goal. Without the helicopter view, you risk losing track of your vision and things are not going in the same direction. For every action you aim to implement, it is critical to ensure it is working towards the vision, and it is not a 'silo-approach'.
- Citizen engagement. This means involving local NGOs that have good connections with citizens.
- Education system. If kids are eager and learn about sustainability and the circular economy, this is very helpful. Here in Slovenia, such themes have been added to the curriculum, mostly at kindergarten already. So kids grow up with the notion of having to take care of the planet. After kindergarten and primary school, the additions to curriculums are not as well-developed yet in Slovenia; this needs to be improved.
- Good relationship between cities and business. Businesses enter the CE; they are changing business models because they want to survive not only out of a good heart. Once they realise the CE has an economic component and is an opportunity for business, it

becomes more interesting. Ensure that there is dialog between the city and its businesses also.
- Market best practices to citizens and other companies, communicate the success stories. Show that the CE can provide jobs, business opportunity, etcetera. Provide visibility- also so other cities can copy-paste.
- Projects can also be used as 'seed-planting'. For instance, the bike sharing initiative in Ljubljana did not only lead to more people using shared bikes; it led to an increased use of people's own bikes. Before it was only regarded as a means of recreation, not transportation. The sharing-initiatives helped change that mind set.
- The last step is connecting dots: If you have example projects, you have an engaged community linking the efforts to increase the impact even more.
- If no funding is available, location facilitation can already be very helpful to support CE initiatives to develop and scale-up. Moreover, the role of the cities is to work on regional approaches: not only looking at developments within the own city borders. Many cities in Europe, besides maybe the big capitals, are still well connected to the suburban areas surrounding them. These areas can deliver fresh food, etc. It is important to also incorporate those areas in CE efforts which is also helpful to become more self-sustainable as an urban region.
- There is a lot of potential for public procurement. Going for refurbished furniture, for instance, pursuing the leasing of light instead of buying it, etcetera. Even on small things in the daily routines, cities can thoroughly look at their own organisation to see how they can procure more circular and probably also to see where they reduce in the first place.
- Even if there are obstacles, uncertainties, barriers, to implement a CE, you have to risk as a city. You have to dare to experiment and implement.
- I see the necessity for cities to facilitate in physical locations where residents, but also tourists, can go to acquire information on how they can behave circular and which can provide information on what it means, and why, etcetera. A central point, comparable to a tourist office. This should be very accessible.
- For every action implemented, it is important to realise that it should either keep the quality of life the same or improve it. To become more circular should not be downgrading your life-standards. Otherwise, it will not work.
- Be exact on where the city plans to create jobs with circular projects and what kinds of skills are required for that. If this is not there, facilitate pop-up knowledge or training centres, for instance.
- Increase the understanding of the relevance of the CE for workers among labour organisations. Now they are mostly fighting changes but, if they would understand the possibilities for job creation if we shift work processes to more circular ways, they could potentially be much more supportive.

Obstacles:
- How to finance scaling up of CE initiatives? This is often challenging. Not even due to lack of resources but also because it takes so much time, so much reporting, that they are not even able to do this. Their core competence is somewhere else. So, for me personally, it is so sad that these start-ups are killed because they cannot acquire the money due to bureaucracy, not lack of funds. So that is an important issue: provide money in a simpler way for these particular CE innovations and projects, especially in the period from the second year to the fifth, during the valley of death-phase. This does not have to be subsidy, but perhaps revolving funds, or providing markets through procurement.

- The risk of providing subsidies is that companies use the money and that's it - but are not working to solidify their business model so they would eventually no longer need subsidies.
- In the circular economy, a lot of things are popping up; some are good, some are bad, and it is important to be faster with investments in such initiatives.
- In addition, it is a challenge to steer towards closing of loops between the various CE initiatives that are popping up. When cities are on their way to circularity by means of loose projects all over the region, it might be best to halt for a bit and zoom out - how to make the transition more connected and strategic? A good starting point would be to conduct a city scan to research the flows in the city, and the potential for CE development within and between these flows. This allows you to recognise also opportunities to connect initiatives and to scale this up. The obstacle is that sometimes this helicopter view is not taken, leading to implementation of separate CE projects, but this then does not lead to an integrated, closed-loop CE so, in the end, moves in the wrong direction, and then you are stuck. Investment in such scans is still seen as risky, or not necessary, or that it is too top-down. However, CE is a combination and especially integration of bottom-up initiatives and steering from the top down. For city governments, this requires active cooperation with research/ knowledge institutes to be able to conduct such scans.
- How we tell the CE story is critical - but the trick is not to create new buzzwords but a new narrative that is understandable and resonates. This is challenging, as this requires that people involved in the CE align their choice of words and the narrative as a whole. Especially as interpretation of a CE is still very different amongst various people, departments, companies, cities, etc. But discussion about definitions only is not the core - there are hundred+ at least. No way that we are going to achieve one universal definition anytime soon.
- The shift in ownership is difficult, especially for countries that have been under communism. If you do not own something, and especially if you are no longer using the newest version but a refurbished car, for instance, it can feel as if people are losing status. It is important thus to encourage people that it is not a matter of not being able to afford the newest car. It is about being smart enough to go for the refurbished one. Hence, it is about changing the narrative again.
- One of the traps to avoid for cities starting the CE transition is that they are focussing on a non-holistic approach or even an optimised waste management approach only. To avoid this, it is important that cities involve experts to assist them with setting up guidelines for the urban transition, as advisors. Especially because, currently, CE talk is much too often about waste management and much too rarely about consumption and design. But it is very important these factors are incorporated in circular strategies.

Can you name what are, according to you, the most critical barriers for which no answer is available yet?
- Measurements and indicators. Although it can be valuable to actively look at what other cities are doing instead of focussing only at potential solutions within their own borders (for example, Ljubljana appeared to be working on a tool that Amsterdam is already using).

Transcript 9.7

R1- Division for Information, General coordination Circular Economy
Capital Region

R2: Representative of the Ministry of Environment - in charge of Circular Economy Policy and Waste Policy of the Region

What is the origin of the Brussels Circular Economy Plan?
R1: We have a long tradition of urban waste management. Already since the 90s, we make new waste management strategies every five years.
R2: However, we have separated the Circular Economy and the Waste Management programmes; these are not the same. Currently, the 5th Waste Management plan is in place. In addition, we have developed the Brussels Regional Programme for the Circular Economy (BRPCE). The two complement each other. The latter focusses on the economy, on SMEs mainly. The Waste Management plan is more aimed at the citizens and focusses on specific types of waste, specifically building waste. In the BRPCE, we work more with sectors, with the whole value chain. Another important difference is that, for the implementation of actions from the waste management plan, we can operate alone. For the BRPCE, however, we need to cooperate with the Ministry of Economy, Ministry of Research. We need them to make and execute this plan.

R2: In the BRPCE, we follow the scheme for circular economy from the Ministry of Environment in which seven themes are addressed: the 3R approach (reduce, reuse, recycle), new circular business models, eco-design, and a few more. We took up this definition. In addition, at each step of the process, we have to think about how to reduce your print on the environment and the use of your resources.
R1: Nevertheless, the BRCPE provides economic opportunities at the local level specifically.

Have you defined specific sectoral focusses?
R2: Yes, we focus on construction, logistics, resources and waste, retail and food.
R1: We organised a big meeting with a wide variety of stakeholders (about 60) from inside the regional organisation itself, from companies, civic society, etcetera, and discussed what the main themes are that we would have to address. The outcomes, however, are predominantly just the important sectors in a city. The outcomes are not based on an opportunity scan for CE development but on this stakeholder consultation.
R2: We chose these sectors also because of the impact on global emissions and the potential for employment.

Who initiated the BRCPE?
R2: The plan mainly comes from my Minister who initiated this. Then the Minister of Economy joined and, finally, also the Minister of Research. Gregroire is now in charge of the coordination. In total, there are fifteen administrations working together.
R1: However, for every separate action, we make one person responsible whose role is to set up an action group and find solutions. Moreover, we have one coordinator per team (logistics, waste, food, etc.). We work through an online platform to share information. So this requires much cooperation, however, within the Brussels region, we are more or less used to cooperating extensively due to the particular institutional structure. This is the way to do policy, since several years.
R2: However, this is the first time that the cooperation is so huge. It is difficult to rightly allocate all budgets and human resources when dealing with so many administrations. It is like a big ship that you have to help change course.

R1: In addition, we encourage the private sector to take the lead with CE initiatives, and we support that with funding, for instance, to conduct a study, start a pilot project.
R2: We do set out specific requirements that we are looking at, for instance, projects on material efficiency, recovery, new CE business models, etcetera; then we look at which projects answer best to those requirements. We announce on what indicators we will judge the submitted projects. And after allocation of a budget, we follow the projects to see if everything is going well; we monitor.

What kind of projects are running now?
R2: We have 70 projects running, but some companies are implementing two or more. It is project-funding. Now our funding comes from the regional budget still. Many projects receive subsidy. But currently, we are also working on setting up a venture capital fund specifically aimed at the CE to be able to invest in the more 'risky' or uncertain CE projects as well.
R1: This allows more room for experimentation. Normal banks will not provide funding, for instance, so it is difficult for the riskier and radical ideas to acquire investments. This is what this fund is for.
R2: We do not engage in public procurement yet; this is difficult still.
R1: The law for public procurement is now aimed at objectivity - everybody has to able to apply. This means it is currently not really possible to demand circularity in our region through procurement as that is not objective. We cannot say we want furniture from Brussels; everybody has to be able to participate. We currently only work with procurement criteria for our restaurants, for cars. But not circular yet. Moreover, in innovative cases, we would need to test beforehand. For instance, using refurbished IT - we would first need to be certain that this could work on full implementation scale.

What other actions have you taken to facilitate the roll-out of these 70 projects, besides funding?
R1: For instance, we are working on the difficulties of the laws that obstruct the circular economy. For example, in logistics, you can deliver, but you cannot take waste with you. So we are facilitating huge discussions on the conditions in which we could make this possible. We include the market parties relevant to such regulatory barriers (such as transport companies in this case), the environmental agencies, etcetera. We can alter these legislations at the regional level. However, these are generally very complex rules, meaning this requires time and thorough research. We created a group that works on identifying obstructing regulations and researching possible solutions.

What are the biggest obstacles so far?
R1: Time. Definitely the resource which is most difficult to find.
R2: Lack of human resources. For instance, for addressing the public procurement issue, we do not have sufficient staff with the right knowledge to address this issue. Moreover, the waste legislation is obstructing still. And we do not have right monitory tools yet - no fitting indicators and analysis tools are available.

Most effective measure implemented so far?
R1: Today, we experiment with private companies on how we can recover materials from buildings. We are running 30+ projects to research the technicalities, the financial sides, etcetera. Thus, we put these innovative questions on the market and finance research with

market parties. We work mostly with market parties and local knowledge institutes and not with universities.
R2: The multi-stakeholder aspect of our cooperation makes it successful. We integrate opinions and knowledge of parties and people of all possible involvement levels.

Transcript 10.8

Representative of urban CE Project Group, former alderman

17.11.2017

Maribor wants to transition everything that is done in the city into a circular way. Luckily, our utility companies are still publically owned which allows us to have better saying on their development. Our primary move to CE development was initiated by a private company from Maribor that is active in circular business transitions. They proposed to us the potential for transition in Maribor. This vision to make Maribor a circular city was subsequently proposed in the city council and supported by all councillors present.

We started with the vision to do waste management in a more circular way. This was the first step. Hence, in the following urban development strategy, the WCycle project was already included. It was the first and only concrete project that could be integrated in the plan. Other projects that are now included are, for instance, brownfield redevelopments, refurbishment of buildings, and so forth. Mostly projects aimed at the public space.

On the national level, we are lucky to have a national government that realises the potential of a CE. We are one of the few countries that has CE included in a smart specialisation strategy of the country, a framework for the transition to a green economy and a strategy for waste management. In addition, the government founded a partnership for a green and circular economy. From seven ministries, secretaries are included in this partnership. So, first and foremost, the national government is showing ambition and vision in regards to the circular economy. In addition, this means we can talk to all of the ministries relevant at the same time if we want to address barriers or issues that we encounter instead of having to address all of them separately. This is extremely valuable.

The starting point for the WCycle project was that Maribor wants no landfill and no incineration. Incineration is just burning your problem. We have decided that, at the centre of our transition plans, are still our citizens. Nothing in the services that we deliver should be a degradation of their quality of life but at least remain the same or improve. What changes are the management of flows (material, energy, and waste water). It is a very extensive project: it links, reuses, and recycles urban material, energy, and water flows on a large variety of scales and keeps all flows in the own region as much as possible (For a full description of the project, see presentation Igor).

To be able to coordinate WCycle, two separate entities have been set up which are separate from the municipality and the utility companies. These are Institute WCYCLE Maribor (IWM) (project coordination) and OptCycle (technical division - aimed at service and maintenance). However, both institutes are in direct communication with the municipality and the utility companies. IWM is the coordination core - we structure the processes and planning, work as

the glue between all the stakeholders involved. IWM consists of three people, however, thirteen more people from the utility companies are IWM-support. They also are involved in decision-making. Meaning that the utility-companies themselves can have influence on decisions. We as IWM can then adjust or set up concrete new actions and ensure all planned and on-going actions are integrated and aligned. We sit together often to achieve this. It is not easy, requires much consultation and good overview and structuring. But a linear and hierarchical approach is the old way; this is the new way. This organisation allows for much better cooperation, coordination, and decision-making which is critical for a project of the scale of WCycle, with so many sub-projects related to it. Without a separate coordinating entity, it is difficult to stay aware of the full picture, of the ultimate vision, which is, of course, essential. Every little piece of work adds to the puzzle. But, if no-one is coordinating the laying of the puzzle, it becomes a mess and you risk working in the wrong directions.

Hence, working together is key. Without extensive cooperation, such circular projects can never be achieved. Within the own municipal organisation, but also outside including NGO's, including SMEs. This regards discussing and consulting *and* decision-making. Only after such multi-stakeholder consultation and decision-making should you start spending your money - not before. The coordination of such consultations is done through the IWM.

Nevertheless, it was a lot of work to get everybody on board for the WCycle project - the obstacles are mainly financial. The municipality does not have a budget large enough to pay for the whole project. We are therefore now applying for European projects to be able to show that what we are doing is significant. This recognition can help to either get EU funding or to get commercial banks on board. This way we hope to be able to better acquire external funding. We do have reserves, but they are not sufficient for the scale of investments that need to be done for WCycle. Because, of course, there are still other needs in the city also.

IWM now also works at identifying obstructing legislation and is discussing with the national government how this can be improved. Specifically, waste criteria are currently a barrier to innovative handling of waste or the use of waste as a resource. This is one of the key barriers still. For every legislation that we encounter that is a barrier, we lobby with the national government. Besides legislation, another important barrier is the understanding of the CE. There is a severe lack in knowledge, especially among the general public. Fortunately for us, the local press now also understands what we want to do, so the coverage has become more positive. They recognise this as an opportunity for the city.

Thirdly, the CE is new, and requires new ways of doing. But if someone is used to working in a certain way, this can be problematic. This requires constant talking, constant informing. And, of course, it requires being able to show results at some point. Again, the recognition that you get from, for instance, being in an EU-project or getting EU-funding helps as people then recognise that it must be something to take seriously, that is relevant.

Moreover, next year, we want to facilitate space for organisations that want to be active in this field, to be located in a physical area where everybody is talking about the CE. These are mainly NGOs that are working in the CE field. We are trying to connect them in this way. We facilitate the locations for a very low price. So these are not our initiatives, but we still

hope to foster the development of CE solutions and innovations by fostering mutual inspiration and communication and low-priced locations for such organisations.

Citizens' acceptance is now the next step. It is not bad, but we wanted to have the core part ready before working on citizen awareness and involvement for WCycle. This is planned for next year. Through conferences, for instance. For the strategic development plan which for which the main body is finished, we want to let citizens be able to comment and make suggestions which we will take into account before finalization. Because, in my opinion, people that come to those consultations are people that really want to be there so they often have either relevant comments or really good additional ideas. They come to share their opinions, hence you have to respect that.

Transcript 10.9

R1: Senior Advisor Department for Environmental Protection

R2: Head Department for Environmental Protection

R3: Sustainability Mobility Department for Environmental Protection

R4: Deputy major

R5: Project manager Public waste company

17/11/2017

How did you become active with CE projects?
R2: Rather spontaneously, we started to implement projects related to the circular economy. Mostly, the idea's for these circular projects came from NGO's.
R1: For instance, for the project on valorising knotweed (an invasive species in Ljubljana) into useful products, it was an NGO who had this idea and approached us for support. Together, we formed a partnership, and we started to work. We worked together with an NGO that was responsible for designing, another botanical organisation was included that knew all about the plants, and finally the waste management company, Snaga, responsible for the collection. The municipality functioned as the coordinator. It was merely learning by doing. And, in the circular economy, it basically comes down to that. We are looking for new ways to do things that are now very standardised; we want to do that differently. The biggest problem for us is that we have to follow very strict rules still as a public organisation. We are not as flexible as the private sector or NGOs. We are not allowed to experiment a lot because we have to report to the citizens how we spend their money and what the results are.

Moreover, nobody actually knows the definition of the circular economy. Everybody regards it in a different way. So a lot of persuasion, cooperation, and communication was needed to explain what it really is in and outside of the municipality. In addition, there is a discrepancy between the old system that is very stiff and the new circular system that we need. But as it is different and people do not know what it is yet, it makes people reluctant, even afraid. Hence, currently, consumer awareness and acceptance of the need for a circular economy

(and the meaning of it) is still quite low. We do have a lot of separate projects in the city, but they are not connected. To increase consumer awareness, we would need to invest in more interconnected circular projects instead of not connected distinct projects.
R4: I agree, I think we have reached a time in our development that we need to invest in a holistic strategy for the circular economy perhaps based on the city scan so that we can work on a more integrated, holistic development of the CE.

Introduction Snaga and the CE
R5: Snaga is the public waste management company in Ljubljana. In terms of waste management and CE, we are active in three fields. The first is Rcero, opened in 2015, which is waste management facility for residual waste and biowaste. From biowaste we produce compost and biogas. It is a self-sufficient facility as we use the biogas within the facility. The second pillar is our vision that separate collection is critical. Now separate collection is already at 66% but has to increase still. We want to return the materials that we extract back to industry and the economy as resources. Thirdly, we actively engage in public awareness creation on the CE (through Snagazin, for instance). We also conduct other forms of campaigns, for instance, aimed at food waste separation in 2014 or the 'get-used-to-reused' programme related to the reuse centre. Because for us it is not only about waste handling but also about waste prevention. Within our own organisation, we use hygienic papers made from recycled packaging that we collect and process, for example.
R1: Snaga even started promoting recycling and the CE before the municipality did.
R5: That we are so active in this is mainly a matter of people. We had the right persons with the right visions that started this development. Especially one of our colleagues at PR who has good views on how to involve the public.

Do you already have a specific circular strategy for Ljubljana?
R2: We have many strategies but not specific circular strategies. In 2016, we got recognized as a European Green Capital mainly because we achieved the largest improvement in the quality of local life in the course of only ten years. In those years, we implemented over 1800 different projects, and many of them were related to the CE. But we did not know at that time that that was the case.

And what current projects are aimed at the CE?
R1: One major one is the knotweed project.
R2: Our bike sharing system, which was introduced in 2011, which is really successful.
R5: There are a lot of ideas in the pipeline, but one of the problems is that is we want to measure the circular impact of those projects. But, for that, we need new ways, new technologies perhaps that can facilitate in this. Now the indicators are not right.
R1: In addition, we are also co-financing projects of NGOs. These are projects that NGOs are carrying out, but they can apply for funds (non-revolving). This year, one of the themes is the circular economy. We put a tender out for that subsidy and demand for, among others, circular projects (the other two themes are invasive species and biodiversity). This way, we can spur bottom-up circular innovation in the city. We leave the tender demands as open as possible to boost new ideas.
R2: We have also been actively pursuing cooperation with all ranges of stakeholders: companies, students, children, and so on.

What are the biggest barriers you have encountered so far?

R1: For us, public procurement is not as useful of a tool as it could be because we are currently still bound to national legislation that makes it difficult for us to experiment while using a public budget. We have to be careful how we spend it. For now, we can only make suggestions to the national state, but we cannot lift this barrier ourselves.
R1: Another is funding - which is a problem everywhere, of course, because there is never enough money to implement everything you want. But it also makes you more creative, more resourceful. In our case, we have a responsibility to the citizens how we use their money. If we are not careful, it can be interpreted completely wrong and you get resistance.
R3: But it is good to be aware that it is not ambition or lack of ideas that is hindering us. It is always funding or regulation.
R1: Or lack of awareness also. For many citizens, it is not clear what the circular economy is. To increase consumer awareness, we ask that they participate in projects. For instance, for the knotweed programme, we actively invited citizens to join and help by pointing out that it is their city, their green areas in which they can invest this way. This we do together with district departments and sometimes local NGOs.
R4: It does not always go as smoothly as we want, of course. Sometimes, such campaigns lead to resistance more than participation; but then, we have to deal with that and design our programme differently the next time. Involvement of local media is helpful for us to spread our message. The local media is curious to innovative ideas. Sometimes they do not accept ideas that we have but, if they pick up on a project that they like, this is useful for us as it provides positive coverage.
R5: Moreover, we give back to the citizens as well. For instance, their increased separation efforts have led to lower waste-bills. So, these practical improvements help show the impact of their actions.
R1: A key thing that is also helpful in increasing citizen awareness is the much larger uptake of environmental topics in kindergarten. For instance, if I do not separate my waste properly, my son corrects me for not being environmentally friendly enough. This is a Slovenian measure though, not specifically Ljubljana. But it helps at the local level, of course. Children are very effective broadcast tools for that matter.
R5: A last barrier that is not mentioned yet is a misfit with taxation. Taxes should shift to promote reused or upcycled products, but this is probably more EU level, not even national. And it is necessary to impose legislation that demands longer lifespans, better reparability - all critical factors for a CE transition.
R1: And, sometimes, there is not a market for circular products.

Most effective tool to foster the transition to the CE?
R1, R2: R5: Cooperation and communication with citizens.
R5: At the end of the day, it is a matter of people; they have to change their habits.
R1: Of course, first you have to have a very successful (or potentially successful) story that you can show to the people, that you can convince them that it is possible, and that it is the right thing to do. The starting point is the vision.
R2: Moreover, what was a key factor in Ljubljana is our mayor. We have a very strong-willed, passionate mayor who strongly believes in a sustainable future and a circular economy and who encourages and supports us to do innovative projects.
R3: Indeed. Because what his determination provides is a feeling of security, certainty that you can be innovative. Moreover, he helps us to stay focussed; he makes sure we are not randomly implementing innovations but that we are working towards that vision of a sustainable, circular future.

R1: This is especially important because, in the CE, there is no copy-paste example. Every city has to find out how to implement it within their own city borders.
R2: In addition, these kinds of circular projects and visions require far-reaching cooperation between the various municipal departments - this is a key institutional change. This cooperation is also something that is fostered by our mayor. It is his first demand, and he is very actively ensuring that this cooperation remains in place. He often says, 'We can discuss whatever issue but not that you do not want to cooperate.' This does not only apply to municipal departments. It is also important to cooperate with other public companies, the private sector, and citizens.

Transcript 10.10

Project Manager at Urban Economy DG - Smart City Unit

17.11.2017

The Urban Economy department of the Milan Municipality is a division of which the ultimate goal is job creation and economic development at the local level. As representative of the Urban Economy Department and Smart City group, he leads the informal unit on the circular economy together with the co-chair of the working group, a person from the environmental mobility agency who provides technical support. At the same time, a representative of the food policy group is part of the CE working group as well. So the CE group is a cooperation between DG Urban Economy, Food Policy, and the Environment and the Mobility (technical) Agency. This group came into being after the three departments independently appeared to be investigating the potential to start working on the development of the circular economy. For the Urban Economy department, the starting idea was to not talk about waste when talking about the CE as there is already too much discussion about waste management and that focussing on waste management is not a CE approach; it's waste management.

Instead, we aim for three sectors: the starting point was the fashion industry, which is obviously large in Milan, a city with a high fashion economy. How can circularity be integrated and improved in the fashion market? And the other component was how to improve the FabCity (making industry - largely SMES) in the city. And, thirdly, organic waste coming from the food policy department. A 67% organic waste collection is already in place, so we have a responsibility to do something with this. For example, three years ago, we started funding a programme for start-ups related to the CE. It was like a private foundation from two universities. One of the companies we engaged was Orange Fibre: they produce textiles from orange peels. Now one of the large fashion brands (Ferragano, red.) will use 30% of this Orange Fibre in the next collection. So that shows that there was already experience and willingness from the fashion industry. Even more so, the fashion industry is asking for the city to support them. They now (finally) understand the economic opportunity of the circular economy. They engage the city in doing interesting activities such as the Green Carpet Fashion Awards (Sept. 2017). Thus, in the fashion sector, there is demand for CE developments. There are bottom-up requests from the market. This provides opportunities for a CE working group - which always needs to think about budget. This way, the market can (partially) cover the costs.

The other focus is the manufacturing industry - Milan already had adopted the FabCity approach[5], which is a programme coming from Barcelona. The CE development links greatly with the efforts of FabCity. The material focus of the CE can be combined with the FabCity structure. So, for Milan, the making industry was a logical theme to include as a CE focus. There is already a network of ten or twelve FabLab makers, and it is something that the companies understand. They understand that, if they want to compete on the market (as they are all SMEs), they need to work on their know-how and digital processes. On the other hand, their size allows them to adjust and pivot easier than large industry. The digitalization and digital infrastructure needed for the CE transition is an important focus and pillar within this making sector. The city of Milan is 100% covered by LORA, a low-range transmission range, used by the FabLabs. This facilitates the conditions, the infrastructure for innovations. Moreover, the focus on design is important: this can allow for better reuse and in the end recycling (also for fashion). Design for re-use and repair. How to get this design to shift is still a key question.

So, for Milan, improving the design, facilitating the digitalization underlying the transition and the fashion industry are the main focus to move to the CE. It is, therefore, mainly coming from the bottom up.

Now, the city is going to design guidelines - not a plan. If you design a plan, you need a dedicated timeline, it requires resources, and competences - which we do not all have. Currently, we do not have the right infrastructure yet, and the right capacity to work with waste circularly. For instance, there is a national law that obliges companies to deliver their waste at certain points which obstructs other uses. If you design a plan without having all competences, this is tricky because you foster expectations that you cannot live up to.

For several of the national legislations, we are discussing with the national government what could be improved, and we ask for the possibility to implement pilot cases of CE at the local level so we can increase awareness and we can facilitate experimentation. This way, we can easier explain to the parliament and the national government what the real needs are of the city. So we are moving and supporting national understanding as well. In addition, on a regional level, there are several funds available for which we are now discussing how to allocate that budget.

The CE working group has not defined specific targets (yet); however, this will probably never be implemented - as a city, we need the smart and circular city to become part of the ordinary work - not 'special' work which is project-based only. For now, this is not the case yet, but we have only been operating for six months: not enough time to answer this question. In order to be able to achieve this shift, you always need to be able to show to your colleagues that what they are doing is not 'additional' work: it is a way to simplify their work. But they are not used to it so, in the beginning, it feels additional.

At this moment, we do not have a lot of specific CE projects running yet, but an application for funding for some projects has been sent out. Moreover, we support several initiatives that

[5] Fab City is a global project to develop locally productive and globally connected self-sufficient cities, focussed on local production, making and collaborative platforms.

we ourselves are not running by facilitating locations, for instance. We also facilitate an incubator kind of programme which is not led or run by us but for which we provide a part of the funding. Moreover, the Orange Fiber agreement with Ferragano was facilitated by us; through our network, they were able to establish this. So we are doing small actions and activities that, at the end of the day, help the transition to a CE.

Biggest barriers encountered so far:
- We spent time at the beginning to understand the resource flows in the city. But this is really difficult to estimate because there is data available for waste, for water, for energy, but not for goods. But this is basically the most important part. Because if you know what goods are entering and going out of the city, you can understand what the resources are that you would be able to locally use. But this is something that can probably only be solved at the regional, national, or even commission level. It is a problem of data capture. We are looking into whether we can use our universities, for instance, to do a scan for us to see whether they can identify our resources or even to see if they already have data available. Not only as a matter of technical deficiencies; also as a matter of insufficient transparency, companies do not want to share information. But it is mostly that goods are flowing in and out of the city without any form of control. Even the association of the chamber of commerce does not have these kinds of numbers. So this is something that might be able to be changed by a legislation framework. Not that we want to be monitoring, but maybe working with a declaration of what you are collecting and what you are not collecting so, within the city, we know where we can find the resource flows.

- Legislation: obstructing waste legislation primarily.

- We are not a managing authority of the available funds - other cities often are but not Milan. For us, the regional government decides upon allocation of funds. We take our time to communicate, to share our objectives with the regional government, to direct funds in the direction where we deem them most beneficial. In addition, there is EU regulation on our (southern) budget so we cannot allocate more money if we deem it necessary (not even talking about funding that we need for the city itself but to facilitate CE initiatives, for example).

So the barriers are mainly technical, knowledge - data problems, and legislative and financial barriers.

In addition, the circular economy is sexy and attractive for the market – meaning, at this point, it appears as if the market is more advanced than the city in the CE development.

Another problem is that, often, cities are promoting their circular economy as a waste management issue. That is the biggest confusion, an error often made. But confusion is normal when you move to such new concepts; that is part of the game.

Moreover, we are now in a linear model in which big companies are extremely important. But is that the right model? I expect we need to move more to platform-cooperation models, which is a much better frame for CE business (personal opinion). Shares risks, shares associates. This requires transparency but, if you share risks, also this is an incentive to share knowledge as well.

Most effective tool for CE transition in Milan?
- Current: the fashion industry. If they are able to function as an example that has influence. Moreover, they move a lot of money. A lot of investors are involved; that could be a really valuable asset.

- Future: private funding opportunities for SMEs. Getting support for them from the private sector could be another scaling opportunity for the market.

Final remark:
There are a lot of strategies and plans developed - but designing a plan without a budget or time schedule is not a plan and is dangerous as it leads to unmet expectations. It is important to frame the transition as learning by doing, as a vision. Calling it a plan when it is not a plan can be damaging for all cities that are trying to become circular. Public procurement is not a plan. It is using current instruments in a different way which is a good way: using existing administrative tools to promote circularity. Especially tendering and procurement are critical. That way you do not need funding - you need to create demand with your own market power.

Transcript 10.11

Manager Public Organic Waste Management Company

20.11.2017

AMSA is the Waste Management Company of Milan. AMSA is part of the A2A group, a multi-utility group. A2A consists of various companies that deal with environmental services, heat and energy distribution, collection and transport of urban, commercial, and special waste. A2A is 50% publically owned (by the municipality of Milan and Brescia), and the other 50% is shares of private owners.

AMSA is has been successful in organic waste collection and recycling and has often functioned as an example for other European cities. The household organic waste collection was initiated in 2011. The city of Milan wanted to increase recycling and increase collection of household food waste. Hence, the city council developed a policy that makes it mandatory for citizens to participate in organic waste separation. It was already mandatory for commercial enterprises, bars, and restaurants since 2000. The novelty was about the inclusion of households as well. The collection started in 2012.

For AMSA, this meant needing to buy new bins and facilitate the collection infrastructure. But also, awareness creation was part of AMSA's responsibilities. First of all, every household (as well as all building managers) received a letter. This mainly regarding logistical information. With the letter, we also delivered a brochure, a campaign, we constructed a new website, and developed a smartphone app. Moreover, every building got posters with information. Lastly, we organised public meetings in every suburb.

We noticed that, three months after the start of the collection, we already reached a very good level of collection. It keeps increasing, after five years still, although not as much as

before. Overall, we are now close to 21% of the total collection of municipal waste to be food waste, which is a really high rate. But we are not actively investing in increasing this level through general awareness creation anymore. What we are implementing are campaigns about specific problems that we encounter (such as the use of the wrong plastic bags or contamination with diapers).

The processing of the organic waste is not done by us. We send it to a private plant where they conduct anaerobic digestion. In this plant, they can filter the non-compostable material out (which is about 5%) and subsequently make biogas and compost of the remaining fraction (Montello Company). The ultimate goal is to produce gas as fuel for all our trucks. We already have one third of our fleet (350 trucks) on methane fuel. This way, we can really close the loop by keeping the gas of Milan households within the Milan region.

For us, the biggest barrier is the presence of non-compostable materials inside the waste which is mainly due to a lack in citizen knowledge leading to contamination of the waste streams. But this contamination is not specific to organic waste; that is the case for every waste stream.

The municipality obliges us to monitor the quality of the organic waste fraction collected. Thus, inspections take place of waste bins (that are put outside for collection). If we see that you put in plastics in for instance, you get a fine. If the bin is part of a building instead of a private residence, the whole building gets a fine. This way, we ensure compliance. Without monitoring, the collection and purity rate would never be so high. This is based on the fact that we supply the bins, the infrastructure; we want this organic waste processing to work. Moreover, the goals from the EU for recycling are high (50%) as well. So you have no other option than to monitor and enforce to be able to comply to the rules. Especially since, in Italy, the rate is even higher; 65%. This, we have not managed yet, but we are steadily increasing and are fortunately well-beyond the 50% demanded by the EU.

Transcript 10.12

R1 City Energy and Environment Department
13.12.2017 - By phone

Seven years ago she started to work for the city of Antwerp on the circular transition of the chemical sector in the city's harbour and industrial region. However, the city of Antwerp has not adopted a specific city-wide plan aimed at moving towards the circular economy. Therefore, there is not one initiator of a CE programme. Nevertheless, there are many CE projects underway, which are all coming from the various administrative departments in the city, among others, her own department (Energy and Environment). Thus, the transition efforts of the city of Antwerp are mainly pushed from the administrative level and not from the political level. It is important to note that it is the market, which is also clearly asking for and working on more CE development. Within most city departments, there is someone working on the CE and on CE projects, however, this is often not the only task of this administrator, and often CE Manager is not an official title. Hence, there is no dedicated CE coordinator in the city nor in the separate departments. Nevertheless, the involved administrators from the various departments work very closely together in orchestrating and aligning all circular economy projects and also work together on projects.

More than a few of the circular projects conducted by the various departments emerged from the knowledge that policy targets could be achieved easier or other improvements could be made by moving to a more circular approach. Others have started due to a determined and CE-inspired administrator. But as there is no city-wide political ambition laid-out for the CE, no initiatives came from a vision for the city as a whole.

Almost every project is done in partnership with private stakeholders, mostly the relevant market parties (parties from the construction sector for the 'building advice' (*bouwadvies*) programme, for example). In general, projects are first coordinated and constructed amongst the various involved administrators/ administrative departments after which it is taken to the market parties for further consultation and possible alterations.

There are several projects currently in development. The department for public space has now started with metabolism scans for the city. This is run from their department only. Another large-scale project is New-South, a new neighbourhood in Antwerp which has been designed and constructed as sustainable and circular as possible. In this area, we included maker spaces aimed at circular designing but also repair, etcetera. Hence, we do not focus on one specific circular strategy but try to address and combine multiple. In addition, as the initiatives come from the various administrative departments, it depends on their priorities and ideas which sectors are addressed; there is no specific agenda which determines which sectors to focus on for CE development. Other projects that the city has been involved in are, for instance, the incubator programme for circular chemical start-ups located in the Blue Gate-hub.

The role the municipality fulfils for the various projects differs per project and per department involved. In most projects (for instance, the incubator project), the municipality functions as the facilitator of the idea and the physical space and often assists with either funding itself or with finding funding with the right networks, marketing, etcetera. The municipal departments are rarely the executors but function as instigator and coordinator. Without the municipality, there would never have been a circular New South area, for instance.

We make use of a variety of administrative instruments to achieve our goals, as explained, by linking stakeholders and promoting collaboration and knowledge development, by demanding circularity or sustainability through tenders, and by facilitating marketing support. Moreover, we often function as the supporting institute for the acquiring of funds. For private, bottom-up initiatives, the Stadslab (city sustainable innovation lab) and the entrepreneurial desk are available. The first is really aimed at helping to further roll-out and potentially scale up local initiatives through funding, marketing, and networking support. The latter is a desk for any entrepreneur, however, there is a dedicated team available with expertise on sustainability.

We are also part of the Flemish circular procurement programme which is becoming more and more successful. However, at this point, our procurement is not yet sufficiently circular; it is not yet a dedicated task of the procurement department nor is the demand for sustainability (let alone circularity) sufficiently institutionalised amongst administrators. But the most important instrument that we use, at least for the Energy and Environment department, is frequent and far-going collaboration with market parties. In the Building

Advice programme, we aim to achieve more circularity by annually looking at best practices from the building sector *with* the building sector. This way, we allow for these best practices to become the standard for building and construction.

The biggest barrier at this point is that there is no coherent vision or ambition carried by the political level for the CE in Antwerp. This means that framework and direction within which we can operate and innovate is lacking. Personally, also the lack of a city-coordinator for the CE is an issue, but not everybody agrees on this. Moreover, much more organisational learning on the CE has to be achieved to allow for better procurement and better understanding of the meaning and urgency of the CE in general. Because, when the CE remains as unknown and vague as it is now, transitioning to a CE remains difficult (*onbekend maakt onbemind*).

In terms of funding, there is no separate CE budget as there is no umbrella CE-plan for the whole city. Nevertheless, the city does possess a dedicated sustainability budget which can be used for CE projects, for instance, for subsidies. Moreover, as most CE projects are initiated by the separate departments, the required financing also comes from the budgets of these departments. Yet, whenever it is possible to get a subsidy, we try to do so. For Antwerp (and most other Flemish cities as well), an important funding source is Flanders. The Flemish government has a sustainability budget available that is not particularly aimed at the CE but can be used for CE projects - hence, I dedicate the funds we get from that budget to circular initiatives. Moreover, Flanders Circular does have specific funds available for cities to roll-out circular initiatives. Whenever a circular project is started, this fund is addressed with a request for funding.

The other source of subsidy that we make use of is the EU. Our department gets the most subsidy from the EU because we do not get a lot of budget from our own city treasure. However, this is city-dependent. In Ghent, for example, the local government if much more leftist and has sustainability higher on the agenda. There, our 'twin'-department gets much more local financing. Within our department, we have someone available that dedicates 50% of the time to acquiring European subsidies to be able to initiate the projects on our agenda and also the staff on our team. I think about half of the team is subsidised. Nevertheless, our team is still too small. This is the ever-existing issue of not enough staff and not enough funds available. To improve this, it is also important that we make more clear what the city and what the partners from the helix should do and contribute. Partners often contribute financially already (how much differs per project). Yet, better understanding of the division of the tasks, roles, and feasibility of your projects is necessary for better division of costs. Now, often, the city attracts too much to itself in terms of tasks but especially funding.

In addition, our department also likes to work with cooperative initiatives. For example, in New South, residents have to organise their own energy cooperative. We provide the funds, however, management is transferred to the cooperative. Through our sustainability innovation office, Stadslab, sustainability subsidies are provided to relevant applicants - however, the office tries to steer towards co-partnerships with other parties to move to shared funding. Lastly, we also work with revolving funds, for instance, in the 'living harbour area'.

Transcript 10.13

City Expert Climate, Energy & Sustainability

19.12.2017

Policy/ strategic level

The city of Roeselare is currently working on the 'sustainable energy and climate action planning' report which is being made as part of the agreement with the Covenant of Mayors. The vision presented in this report is based on an updated version of the 'Trias Energetica'. The traditional Trias is about reducing energy consumption and spillage, increasing the use of renewables, and making use of those fossil fuels that are needed in a way that is as efficient and clean as possible. The 'Trias 2.0' is different. Step one is reducing energy consumption in a structural way. So not only in households, as in the traditional Trias, but also by integrating a vision for reduced energy consumption as much as possible into all levels of planning, infrastructure, etcetera: How does the city have to change to reduce demand for energy? The second step is looking at materials as well and implementing a circular economy. The two things are going hand in hand: a CE is necessary to be able to have a sustainable energy supply. The third step is that fossil fuels are phased out entirely and that the city runs on fully renewable energy.

Hence, Roeselare does not have a separate CE strategy, but the CE has a place in our energy and climate action planning. We integrated the CE into our broader vision for a more sustainable city - which is based on a sustainable energy supply and energy system. To make this possible, you need a circular economy. Hence, the CE is a tool to achieve a sustainable city and a goal in terms of material use.

The signing of the COM was initiated by the mayor and his crew and several other aldermen. Execution and construction takes place on the administrative level, however. To understand how this is organised, it is important to understand the organisation structure of the entire administration. There are three departments: space, people, and facilitating services (the latter being mostly an internally focussed department). So, in essence, there are two big departments running the city. Within the space department, he himself is active in the policy department. Within the policy department, there are colleagues of spatial planning, mobility green infrastructure, energy and climate planning, GIS staff and housing. So there are six big clusters in one department. The idea behind this is that you can move towards much more integrated planning. This form of organisation is pretty new, only one year and a half old. The idea is that this structure makes it much easier to get all the teams included in project coordination and execution. But, in reality, this form of work organisation remains to be very difficult. There are a lot of projects, but the mainstream instruments to facilitate and structure this sort of integrated planning are not yet in place. For instance, the processes, procedures, techniques, and methodologies are non- or underdeveloped. Hence, we are still in the very first stage: we sit together, spread ideas and share feedback on the table and create the vision for an area. But the next step of how to organise execution and actually putting it in place is still another question. Remains to be a problem that we have to bridge.

For one thing, we have to become more exterior oriented. We have to increase our focus on stakeholder mapping and inclusion. Because, if you look what needs to be done to become sustainable, you know you can never do it as a city on your own. Cities do not have the

capacity to do all the work alone. Hence, it is paramount to put up cross-sectoral, multi-stakeholder networks that really work. We can setup community platforms that bind people, but that is not enough. It is also necessary to share visions, ensure alignment and coordination, working towards shared and set goals that address all stakeholders. And this has to be done cross-over. We are experimenting with this kind of networks. For instance, the plan for the COM, we tried to include many relevant urban stakeholders through action-oriented meetings. Not addressing what to do only but especially how to do it, and how does that influence our roles?

Internally, we are now organised in such a way that we work in two departments, meaning we work in projects and no longer in administrative silos. So, for a project like the climate action planning, we are sitting together with people from previously very different departments. Hence, this is not easy. The walls might be broken down institutionally but not yet in the heads of people. Thus, there remains to be a lot of resistance – culturally, most staff are not ready yet. This takes time. In addition, on the political level, the aldermen and the mayor do still have their teams. Thus there is a mismatch between the political structure and administrative structure. Political decisions are made in silos and teams but, when it reaches the administrative level, the approach becomes more multi-disciplinary, cross-sectoral. Hence, this political system has to be changed still. After the election, we can do some suggestions to change this structure and provide input into how the different teams at the political levels have to be organised to match the administrative working structure.

In terms of funding, this new structure means you have to match the budget, which are crossed over the different departments. Because the largest funding source is still our own money (city level): the budget from the two departments. The thing is that, before the re-organisation, Roeselare was really internally oriented. There were not a lot external oriented actions implemented. The city was really internally focussed, doing just the stuff that the city has to do to keep the city running. Now we are a much more externally oriented organisation. However, as explained, this has only been for a year. The extra tasks require extra money, but we are not used to acquiring external funding; we are not organised as such. We do not have the networks and experiences yet to manage to get sufficient funding to the city. We need to work on both things together. We do not even know of all available funding yet. Now we mainly work with Interreg, which is valuable for some things but not for everything. We are also trying to get more used to acquiring funding from the Flemish Government.

Operational level

At the moment, we are involved in several circular economy related projects. One project that we are now executing is actually based on the methodology developed by prof. Jan Jonker, which works very well. The methods provide a lot of dynamics. We are building up processes together with civil society and private stakeholders regarding the repurposing of a building. We bought a building - there was a need for space for social innovation in the city. The goal is to reorganise and move multiple social organisations to that building. But we do not just want to stock organisation there but also want to make it a living building. The other part of the building is available for innovation, driven by activities of the social organisations. For example, cafeterias, restaurants, and sports facilities. The ultimate goal is to facilitate support for talent creation and capacity building for the vulnerable groups in the city. Sustainability is completely integrated in building planning. Eventually, we also want to use

the methodology of prof. Jonker to look into through which business models we can organise the management of the building.

Moreover, we are working on a project for circular procurement, and we are going to buy new materials for the maintenance of public spaces. However, we are going to do this differently. We put up an internal platform for internal sharing. The equipment acquired is better quality and easier to repair. With maintenance scheduled, this expands the life-span of the equipment greatly while costs are reduced due to sharing. We are now also looking to see if we can implement such systems within neighbourhoods.

Lastly, we are involved in a project on buying insulation for attics - if people agree to insulate their attics, we are going to help them to clear it out. But, the materials that we are acquiring we are going to try to repurpose as high up to circular ladder as possible. Can we reuse it or repair and resell it? This is also a social mobilization project, increasing awareness on the value of the things and materials that people own, and brings down the CE to a very practical level.

Within these kinds of external projects, we as the municipality mainly act as the driving factor and take up a coordinating role. We involve other parties for execution. We work with all kinds of stakeholders available depending on the project. Market parties, research institutes, but also NGOs or other civil organisation.

To spur private CE development and innovation, we have several instruments available that we can implement. One is through procurement. Another regards circular spatial development. For example, we are looking into the planning process for parking places. Can we decide to build them up into space (in the form of a parking tower), instead of spreading them on the ground? What happens then with the area, and what other things can we do with it then? And, if we are going to pursue a tower, can we make it circular? With a modular design, for example?

The biggest obstacle for external CE development is still that people do not know anything about the circular economy. Our city has a lot of primary and secondary schools, but if you would put up a survey to ask about whether they have circular themes in the curriculum - there would be none. They probably would not even understand the question. Thus, within the schools, circularity is not integrated at all. That is one issue. And within most companies in the region, it is still very much in a primary phase. There are some front-runners, but they are so far away that they lost touch with the mainstream companies. We do see a role for ourselves to bring the front-runners and other companies back together, back to reality. Allowing them to get (re-)acquainted, discuss what projects could be realised, make agreements. Facilitate development from scratch to execution. We are already doing this for energy, but not yet for the CE. Companies are interested in innovation, but sometimes they just need an external incentive to get at the table, talk about it, and see what comes out. That is something what we can facilitate.

We also have some citizen awareness projects running, for instance, climate schools - which is a design workshop with primary schools in which the ideas of the students about more sustainable school areas are tapped into. They have formulated some interesting ideas, and now we are looking with companies to see how to one or more can be implemented.

Currently mobility is the new topic. Students have to pick it up themselves and, as there is very little knowledge on the CE, the chance that they will bring up a CE as a topic is low.

In terms of funding external projects, this is primarily based on subsidies. However, if we put up projects, we always look to see if and how we can develop an alternative business model for it. For example, we are replacing two cars in our own fleet. The first requirement is that they are going to be electrical and need to be powered up by solar panels. Thus these cars include batteries - hence, are there any smart grid learning options? And can we also get citizens acquainted - for instance, by sharing the cars? Maybe we can find a partner that is interested to place a business model on this idea? We always try to look very broad and see if there is a possibility to integrate novel business models because municipalities are getting less and less money. So we have to look for new ways of getting funding, for example, through crowd funding, cooperatives, etcetera. Can we involve citizens in a financial way? In the neighbourhoods, there are financial flows in fossil structures - how to bend those funding streams into the use for more green and sustainable infrastructure? These are key questions. The money of the municipality should not be the only flow. How to expand this? The sustainable city of the future is not realisable if the city takes all financial credit.

Appendix 11 - Identified barriers and interventions interviews

As described in section 2.1.2, thirteen interviews and two test-interviews have been conducted over the course of the research.

Supplementary table 14, Supplementary table 15, and Supplementary table 16 show the assemblage of the barriers deduced from the interviews. Supplementary table 17Supplementary table 18, andSupplementary table 19 present the interventions deduced from the interviews. The findings are clustered per Urban Agenda theme (better knowledge, better regulation, better funding). Within the clusters, there is no hierarchy in the order of the items. The numbers behind each comment show in which interview this was stated.

Barriers

Supplementary table 14. Barriers identified related to the knowledge domain

Better knowledge
There is no coherent city vision for CE development, meaning the boundaries and directions in which you can operate and innovate are lacking (6, 7, 14)
Circular urban development should ideally start from a holistic approach, a value chain perspective, instead of a waste management perspective (1,2, 6, 7, 10, 13)
Confusion and various interpretations on what the Circular Economy is amongst stakeholders (1, 2, 3, 6, 7, 8, 9, 10, 12, 13, 14, 15)
CE requires far-reaching consultations and cooperation within value chains. This demands a certain level of transparency of which companies can be very reluctant (1)
Circular economy developments cannot be measured yet - there are no fitting indicators (1, 2, 6, 7, 9, 10)
Within the own organisation there can be lack of willingness to work circular (due to resistance to change, lack in knowledge regarding the necessity and requirements of becoming circular, etc.) (1, 8, 15)
Large variety in the maturity levels in terms of CE of the various stakeholders involved (1, 15)
CE development requires new levels of cooperation, consultation and co-creation among all stakeholders involved (1, 2, 4, 6, 7, 8, 9, 10)
CE development requires trans-department working group that facilitates and coordinates the transition. This costs huge amounts of time and efforts (2)
Redesigning the administrative structures into congregated departments instead of silos requires a shift in organisation culture as well - if not prepared and managed well this can be very challenging and obstruct cooperation (15)
A lack of (private) innovation power in the urban region can be a barrier to CE innovations (2)
Currently the CE has no 'evidential value' - still has to be proven that it actually works, that the CE is achievable, cost-effective, based on a viable business case (2)
It is not clear what competences are needed and are available (or not) within the own organisation to be able to foster the transition to the CE (2, 7)
Labour organisation are not on-board for the circular change (6)
When no coherent strategy for the CE is existent and various initiatives are popping up, it is difficult to

steer towards a coherent CE vision, and to connect the dots between the initiatives [6, 9, 14]
Shifting from ownership to service models can be challenging - especially in ex-communist countries[6]
Citizen awareness on what the CE is very low, resulting participation is low [4, 8, 9, 15]
No uptake of CE in curricula at all [15]
There is a lack of data available to determine the resource flows in the city [10]
The political and administrative structure do not match - politically decisions are made within 'silos' while at the administrative level a more multi-disciplinary approach has to be pursued [15]
Support and ambition for long-term CE development at the political level is crucial to be able to construct long-term transition plans [2]
How to integrate circular procurement in the budget plans and annual accounts? How is value defined if you shift from ownership to leasing for example? [2]

Supplementary table 15. Barriers identified related to the regulation domain

Better regulation
Local legislation can obstruct the use of circular products in the urban space (such as the reused of refurbished materials), many of the obstructing legislations that exist are very complex rules [1, 7, 8]
National legislation can obstruct circular economy developments [1,2, 10]
Current city development strategies are silos - strategies and regulations for heat, waste, energy, materials all regarded separately [3, 6]
Procurement laws currently demand too much objectivity to be able to steer towards circular procurement [7]
The taxation system obstructs CE development [2, 6, 9]
Waste legislation [1,2, 4, 7, 8, 9, 10, 12]
CE product are often more expensive that virgin materials and products as externalities are not included in virgin prices [2]
Changing procurement standards can be very time consuming and expensive [3]
As a public organisation you are not flexible, but have to follow very strict rules and are not allowed to experiment a lot, for instance with procurement [9]
The city itself does not manage their own funds [10]

Supplementary table 16. Barriers identified related to the funding domain

Better funding
Funding schemes are aimed at project funding. However, many innovations in the CE come from small companies. But for these companies it is not possible to apply for project funding [1,2]
There is no market for secondary materials yet [2, 4, 9]
Local funding procedures required to undertake for innovative CE companies that want to apply for investments to scale up can be too time-consuming and difficult or inadequate for the start-ups to succeed [6]

Subsidies can lead to insufficient development of self-sufficiency [6]
There is insufficient venture capital available for CE innovations [7]
Insufficient funding available [8, 9, 10]
The city is institutionally not used to applying for external funding [15]

Interventions

Supplementary table 17. Interventions identified related to the knowledge domain

Better knowledge
Facilitate the city as a 'living lab' with room for CE innovations and experimentations - facilitate locations, data, networks for free or a low charge [2, 6, 7, 8, 10]
Invest in identifying what knowledge is available within the municipality and where, how to connect the available knowledge to facilitate the CE, and what are the knowledge gaps. Combining this learning into a 'knowledge agenda' that can be addressed when executing CE projects [2]
Implementing example projects to 'plant seeds' and foster citizens uptake of certain processes or behaviours [6, 9] (city bike example Ljubljana)
Spread specific innovative CE questions of interest to market parties in the region - allowing for the bottom-up uptake of these topics while the market is reassured of the urban relevance of those questions [7]
Set up or facilitate a start-up programme/ incubators where innovative companies are supported to come up with circular solutions [1, 10, 14]
The municipality takes a facilitating role, but does not push the transition to a CE - the market, knowledge institutes and citizens have the lead [2, 7, 14]
Design and communicate a long-term vision and ambitions for the CE, which provides the security to start working on the CE and CE initiatives, for both municipal departments themselves as well as market parties and knowledge institutes. This vision is not set in stone, but provides guidelines and demands pivoting and constant evolving of the development process [1, 2, 6, 9, 10, 13, 14]
Start off with a metabolism scan for the city, in which the urban flows are identified and analysed and it becomes clear where in the various value chains opportunities for circular development lie [1,2, 6]
Identification of which are the value chains with high CE potential can help to start of CE innovations in the right area [2,10, 13]
The waste management starting point might seem easier/ better fit with competences of city - yet dare to shift to a perspective of learning by doing, allow for experimentation with holistic CE development [2]
Involve expert organisation in the very beginning that can explain and guide the direction to a holistic CE [6]
Split the waste management programme and the CE programme, which complement each other but are not the same [7]. The CE programme can then be aimed at value chains, the waste management programme at what managing of waste coming from households
Facilitate knowledge development and achieving a common language with market parties [2, 15]
Invest in knowledge development and achieving a common language with the national government [2]
For specific value chains/ CE tools: develop route maps together with the market, including clear delineations or concepts, meanings and intentions [2]

Research the potential of anonymous data sharing, for instance inspired by blockchain technology, which allows companies to feel reassured about the safety of their company information [1]
Include only qualitative targets and learn by doing - there are no indictors to follow yet. Setting quantified targets would require a certain base knowledge on what to measure and how, which is not the case for the CE [2, 10]
Monitor and evaluate efforts - use evaluations to pivot or pursue [2]
Actively look at the processes, developments and tools used of other cities [6]
Work on internal knowledge development, for instance by hosting lecture nights, field visits, ateliers [2]
Include a project manager in the CE programme from many relevant departments - creates a movement throughout the whole municipal organisation [2]
Communicate and convince the working circular is not additional work: it is a way of improving work [10]
Try to facilitate networks, consultations, bringing the various stakeholders together [1, 14, 15]
Facilitate in learning processes for SME's, by joining them together and allowing them to learn together and share costs [3] (Oekoprofit example)
Inclusion of the market and (local) knowledge institutes already in the research phase, before deciding upon a development strategy/ vision [1, 2, 4, 5, 6, 7, 8, 10]
From the very start, facilitate and pursue internal cooperation with the whole range of relevant municipal departments [2, 6, 7, 8, 9, 10, 14]
Work together and consult with market parties right from the very start of the implementations of the plans/ visions [1, 2, 4, 6, 7, 14]
Include project managers from a wide variety of municipal departments in the CE working group. This also allows for the market parties to address various departments at once when they have questions [2, 7, 8]
In the case of specific projects: work with a (non-municipal) coordinator, that can act as the glue between all participants and that can keep track of the long-term goals and ensure all elements and actions are aligned [4, 8]
Within the municipality/ region, install a new coordinator for every action, who is responsible for setting up and action group and coordination [7]
Redesign the administrative structure from silos to integrated department in which many clusters are represented [15]
Engage in extensive cooperation and coordination amongst the relevant administrative departments themselves, to allow for alignment of CE projects and developments [14]
Try to develop adjusted or novel instruments for the new, multi-disciplinary administrative forms of cooperation and decision-making. Integrate the holistic approach into standard procedures, techniques, etcetera [15]
Clearly communicate the CE vision and long-term ambition. This attracts innovative organisations, and provides more security for the market to innovate and participate [2]
Facilitate physical locations for start-ups and local initiatives to develop CE innovations [2, 10, 14]
Learn by doing: pursue experimentation [1, 2]
Market and broadly communicate success stories [6]
Research the competences that would be necessary at the various municipal departments [2, 7] (spatial planners with knowledge urban metabolism for example)
Invest in knowledge development within the own organisation [2, 7, 14]
Increase the understanding of the CE and the potential for job creation by the CE transition of

labour organisations, to get them on-board instead of fighting changes [6]
Halt the facilitation of loose projects for a bit and zoom out, to work towards the a more integrated CE strategy. A good starting point is a City Scan [6, 9]
Change the narrative. It is not about losing status, but about being smart enough to buy refurbished (for example) [6]
Involve and consult citizens, through NGOs/ local organisations [4, 5, 6, 8, 9]
Invest in awareness creation and participation through local campaigns and citizen consultations [4, 5, 6, 8, 9, 11]
Install physical locations where residents and tourist can acquire info on the CE and on how to behave circular [6]
Work on a strong narrative that can be told, instead of focussing on specific definitions. The narrative is key [6]
Include local press - if they understand what the city/ project is aiming for and are positive, this can help to acquire positive coverage and better understanding [8, 9]
Communicate clearly on what you give back (lower waste tariffs for example) [8, 9]
Develop apps, websites that are available for residents [11]
Execute projects that brings the CE down to a very practical level (attic cleaning example) [15]
Invest in education programmes that are already aimed at increasing knowledge and awareness amongst the youngest, up to higher levels of education [6, 9]
Working together with universities to see whether they do have the right tools or additional data [10]
Adjust the political system to a more holistic version as well, redesigning the mayor and aldermen's working teams to match multi-disciplinary working groups [15]
Invest in learning about the potential for a holistic sustainable urban development strategy [3]
Invest in a core team that truly understands where you want to go as a city and why, which can lead the pursuit of more holistic strategies [6]
Monitor projects/ companies that have received subsidies [7]
Increase knowledge into how tasks can be divided amongst the various partners from the helix - better understanding can lead to a better division of costs [14]

Supplementary table 18. Interventions identified related to the regulation domain

Better regulation
Make use of the power of administrative instruments to foster the transition to the CE. Key: public procurement and tenders [1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 15]
Circular economy is the umbrella-theme to under which all other sustainability agenda themes fall (energy, clean air, climate adaptation etc.) - this allows for the opportunity to keep making impact in those themes, while ensuring they are aligned with the CE vision [2]
Use of loophole-policies to work your way around obstructing regulation and facilitate faster experimentation (Amsterdam-example: use of the 'crisis and recovery-law' to surpass extensive governmental procedures and spur development in a faster way' [2]
Use the power of administrative instruments to provide demand and scale-up CE initiatives (tenders, procurement) [1, 2, 14, 15]
Identify and revise local obstructing legislations to adapt to circular innovations and product use [1]
Set up a working group including market parties, knowledge institutes, NGOS aimed at researching

all obstructing legislation and proposing strategies for revision [7, 8]
Coordinated lobbying at national levels through partnerships with other cities (City Deals example, Amsterdam)[1]
Conduct research into revise procurement regulations to facilitate CE demand [7]
Use the power of administrative instruments to provide demand (tenders, procurement) [1, 2, 3, 4, 12]

Supplementary table 19. Interventions identified related to the funding domain

Better funding
To work towards a circular *economy*, meaning not providing subsidies but promoting self-sustaining projects/ companies [1, 4]
Facilitate tenders for CE subsidies (for research, pilots projects, etcetera), outlining specific strategies/ sectors of interest, to spur bottom-up CE innovation [7, 9]
Support local CE initiatives in finding external funds [14]
Redesign funding instruments in the city to match the organisational form of circular innovations [1,2]
For specific projects: see finding markets as an iterative process. Where might you put your products, what should it look like? Alter the specifics based on experiences. It is impossible to know exactly beforehand [4]
Make it easier for start-ups to acquire investments, especially after the research phase. through revolving funds or procurement for example [6]
Do not subsidise anything other than research [1, 2]
Set up venture capital funds for the riskier innovations [7]
Try to reroute financing streams that are already existing towards more circular investments [2]
Apply for EU funding [8, 10, 14, 15]
Apply for inclusion in EU programmes - provides legitimacy and makes it easier to acquire investments [8]
Apply for regional funding [14, 15]
Look for alternative business models that can lead to other funding streams than only from the city. For example, cooperatives, crowdfunding, sharing platforms [14, 15].
Install an administrator aimed at acquiring external subsidies [14]
Engage in learning about available funding sources and application procedures [15]

Appendix 12 - Generic guidance documents

Scientific articles

1. Franziska, E., Florian, K., Sara, B., Leen, G., Steffen, M., & Markus, E. (2017). *Urban sustainability transitions in a context of multi-level governance: A comparison of four European states.*

General remarks:
Study aimed at elucidating the dynamics of power concentration and power dispersion generated by different national governance contexts through a multi-level governance perspective. It compares the sustainability transition processes of Brighton (UK), Dresden (Ge), Genk (Be) and Stockholm (Se). It is not specifically aimed at CE transition but identifies obstacles and barriers for general sustainability transitions in the various governance contexts.

Barriers and related actions identified:
Supplementary figure 1 Identification of Obstacles and Opportunities per identified governance system. TI's = local transition initiatives. Franziska et al. (2017).

	Unitary political systems		Federal political systems	
	Centralised unitary state of the UK	**Decentralised unitary state of Sweden**	**"Cooperative federalism" of Germany**	**"Dual federalism" of Belgium**
Opportunities	Potential of effective top-down steering of urban sustainability transition if the central government endorses sustainability	Encouraging the diversity of new ways of organising, thinking, and doing	Protecting local autonomy Enabling TIs to play "multi-level games"	Protecting local autonomy Enabling TIs to play "multi-level games"
Obstacles	High dependence of TIs on the vagaries of national politics	High dependence of TIs on the vagaries of local politics and difficulties in coordinating and aligning the activities across municipalities, especially in addressing horizontal, cross-domain challenges	Challenges of coordinating and consensus-seeking across governance levels	Challenges of coordinating and consensus-seeking across governance levels

Common obstacles identified

- 'Projectification' of funding – Often, funding available for local TIs in the take-off phase. However, availability of funds for the phase after take-off is often lacking leading to high uncertainty and instability, which impedes their efforts to promote sustainability.

Common opportunities identified

- Strengthening ties between local TI's and local government allows for building capacity of local sustainability governance.

2. Prendeville, S., Cherim, E., & Bocken, N. (2017). *Circular Cities: Mapping Six Cities in Transition*.

General remarks

Article addresses the question *how cities are adopting the CE as a strategy*. The outcomes in the article are based on the analysis of six cities: Amsterdam, Barcelona, Glasgow, Haarlemmermeer, The Hague, and Rotterdam.

Governance interventions identified

The article identifies six types of policy interventions that can be relevant for urban CE transition. These are adapted from an earlier EMF article. The interventions are:

- Knowledge development (education, information, awareness, etc.).
- Collaboration platforms. The goal of setting up collaboration platforms (either broad or industry specific) is to develop an understanding of the needs of partners and to leverage the partner's expertise and networks.
- Business support schemes. These are often projects aimed at supporting local businesses and entrepreneurs in developing innovative CE business proposals or to further CE start-ups. Often includes fiscal frameworks.
- Regulatory frameworks. Use of rules and regulations to facilitate businesses, citizens, etc. in developing an urban CE.
- Procurement and infrastructure. Use power of purchasing and tendering.
- Fiscal frameworks. Generally national schemes aimed at creating fiscal incentives for the CE.

Specific actions and obstacles identified

Actions:

1. Using own tools such as procurement, tendering, and sustainability funds (Amsterdam)
2. Including and involving businesses is seen as essential (Glasgow)
3. One key alderman compiles and drives the CE agenda (Haarlemmermeer)
4. The main role of the city is to facilitate businesses and citizens towards circularity (The Hague)
5. Close linkage of smart and circular city initiatives (Barcelona)
6. Actively include citizens in CE development instead of pursuing a top-down approach (Barcelona)

Obstacles:

7. How to move to better subsidizing - not calculating everything to the extreme but inspiring innovation (Haarlemmermeer)
8. Risk of conflating circular with sustainable
9. Policy-makers have difficulty grounding circular practices in day-to-day practices
10. While the role of citizens is revered, there is a mismatch in how these stakeholders are included: most significant focus on major urban stakeholders

Generic reports

3. CEN / ACR (2015) - General guidelines for Integrated Circular Economy at Local and Regional Level.

General remarks

This report aims at explaining the potential role of local and regional authorities and at developing guidelines to help them draw up integrated and efficient circular economy plans. Even though acknowledging the broader concept, these guidelines focus mainly on materials considering that it is difficult for local and regional authorities to encompass all topics at once and since material resources represent the core element of circular economy.

Governance interventions

The report identifies six major initial initiatives that local authorities have to undertake in order to facilitate the transition to a CE. These are, in chronological order:

1. Develop a cross-sector approach at the political and administrative level - close cooperation between various administrative levels is a requirement for the CE. Also cross-hierarchical levels.
2. Identify potential stakeholders - early identification and bringing together of all relevant stakeholders is crucial (civic society not included here, though). It is suggested to consider installing a coordinating authority (such as Circle Economy, EFM) for the coordination, promotion, and follow-up.
3. Identify parallel policy actions in progress or planned as a base for further strategic consideration, e.g., in the areas of prevention, reuse, and recycling of waste.
4. Establish a diagnosis of the territorial metabolism that is a detailed description of the industrial and socio-economic reality already existing in the area before the systematic and integrated planning for a circular economy begins. In order to do so, information needs to be gathered on the main streams including materials, energy, water, and biodiversity both on a global and sectorial level. A number of maps should also be established focusing on the streams with the most strategic meaning for the local economy. The existing economic sectors should be clearly identified, paying heed to whether they are strongly developed or weak. Finally, the sectors of the social economy and services should also be considered.
5. Gather information on experiences from similar territories yet keep in mind local specific contexts.
6. Organise co-creation. To enable all stakeholders to play their part, structures for concentration or participation should be organised already at the stage of elaborating an integrated circular economy plan.

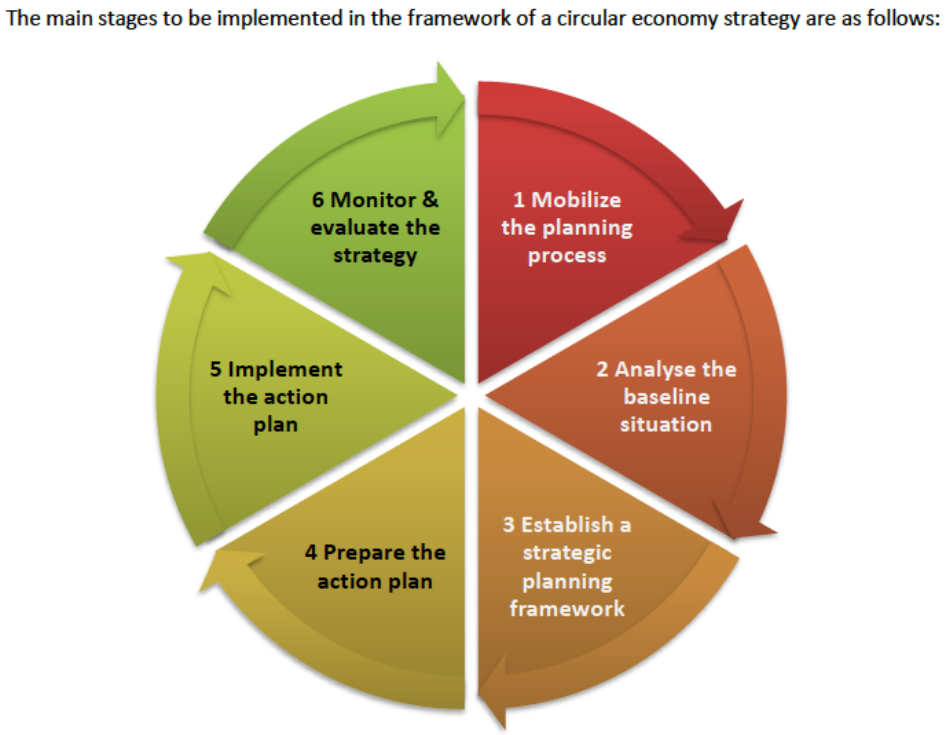
Other measures mentioned:

Regulatory, economic, and technical measures are mentioned, but these are more related to policy and institutional changes beyond local levels - less relevant for local practitioners.

Training and information spreading is more relevant at the city level. Suggestions from the report: organise public debates, pursue widespread public consultation, facilitate online platforms, and include the CE in vocational and higher technical and university curricula.

The planning process of CE development according to the CEN report is as follows:

Supplementary figure 2 Main stages in planning process according to CEN (CEN 2015)



4. CEN / ACR (2017) - Roles of local and regional authorities towards the prosperity of local SMEs.

Generic remarks

This paper is an expansion document of the generic CEN report for local and regional authorities and is specifically aimed at the role of local governments in supporting SMEs.

Governance interventions

There is a high level of risk that a transition to a circular economy will not succeed unless the **government** takes on the **role of a structuring partnership facilitator** between stakeholders. That role involves:

1. Monitoring and following the phenomenon of the transition towards that model;
2. Stimulating public procurement as a lever to boost demand
3. Strengthening behavioural change and the participation of civil society (by raising consumers' awareness to change their attitude towards objects and services)
4. Easing companies' financing during the transition to a circular business model
5. Helping to launch trainings
6. Structuring research
7. Adapting market instruments
8. Strengthening regulatory instruments
9. Setting up regional coordination for projects

Other measures (demand side):

1. Launch citizen awareness programmes

2. Inform industry and retailers (as clients of their suppliers)
3. Procure circular
4. Develop local level reuse/ repair incentives (such as repair centres/ reuse hubs)

Other measures (supply side):

1. Fostering room for regulatory improvements (through, e.g., green deals)
2. Targeted market incentives
3. Set up financing schemes such as investment funds
4. Knowledge spreading - provide those who play a central role in society with the information required to take decisions and to upscale circular solutions
5. Facilitate incubators
6. Coaching schemes
7. Cooperate internationally

5. Circular Cities Hub (2016) - Circular Cities Strategies Challenges and Knowledge Gaps.

General remarks

This document reports on the outcomes of a workshop held in London in 2016 organised by CCH. The workshop brought together academics, consultants, policy-makers and think tanks to develop an understanding of the circular city (CC) concept and challenges to implementation. The workshop was centred on three themes: strategies for delivering circular cities, challenges to the implementation of CC, and knowledge gaps.

Definition of circular city provided.

Governance interventions

Circular strategies: looping, localisation, substitution, adaptation, sharing, optimising, and regenerating. A city can become circular by adopting one or a combination of several of the seven strategies (i.e., the Looped city, the Local city, the Substitution city, etc.).

Challenges identified

1. Cultural - current materialism, consumerism, individualism obstruct circular development
2. Economic - especially macro-economic challenges are crucial (economy linked to resource based growth), globalisation versus localisation, fossil-dependence, competition for space in cities
3. Physical - right infrastructure lacking, lack of space and vegetation for regeneration
4. Political - lack in leadership, lack in long-term visions, insufficient local authority
5. Institutional - inflexibility, lack of engagement with civil society, administrative boundaries obstruct localisation of resource flows, privatisation of utility and services obstructs influence of local authorities
6. Regulatory - underdevelopment of necessary multi-level regulatory framework
7. Information - mainly regarding access, inability to provide sufficiently comprehensive picture of resource flows

6. De Groene Zaak & WBSDC (2015) - Governments going circular. A global scan by De Groene Zaak, Dutch Sustainability Business Association

General remarks

This publication is mainly aimed at inspiring governments by informing them of what works and what is possible.

Obstacles identified

Based on EMF

1. Lack of awareness
2. Lack of substitute materials
3. Linear lock-ins
4. Hampering legislation
5. Based on partners the Groene Zaak:

   • A lack of market advantage differentiation for circular products (especially because public procurement focuses too much on the short-term);

   • The high costs of sustainable certification and integral reporting that need to be worked into the product price resulting in competitive disadvantages;

   • A mismatch between supply and demand of high quality reusable resources, products, and parts. Additionally, the preliminary results of an on-going literature review issued by the Dutch Government as part of the work of the RACE Coalition (Realisation of Acceleration towards a Circular Economy) confirm the following gaps as barriers to the development of a circular economy. Therefore, further consideration of policy action may be beneficial in promoting the circular economy;

   • The lack of skills and investment in circular product design and production;

   • The lack of enablers to improve cross-cycle and cross-sector performance. This is partly due to a non-alignment of power and incentives for transformations within and across value chains;

   • The lack of consumer and business acceptance regarding consumer-as-user and performance-based
   payment models;

   • The lack of knowledge and economic incentives for repair and reuse;

   • The lack of consumer information regarding product origins and shelf-life;

   • The lack of waste separation at source (especially for food waste and packaging);

   • The lack of investment and innovation in recycling and recovery, infrastructure and technology, (related to the lock-in of existing technologies and infrastructure);

   • The lack of harmony in transportation flows within and between municipalities, which leads to confusion among shippers and transporters;

   • Weaknesses in policy coherence (e.g., bio-energy and waste policies);

   • Widespread planned obsolescence within product chains

Actions mentioned that could be implemented locally:

1. Facilitate sharing and repair platforms
2. Procure circular
3. Create a government agency to encourage circular innovations

7. Deloitte (2017) - Breaking the Barriers to the Circular Economy.

General remarks

This is a report about the barriers to the Circular Economy (CE) in the European Union. For this research, a survey with 153 businesses and 55 government officials and expert interviews with 47 thought leaders on the circular economy from businesses, governments, academia, and NGOs have been carried out.

Challenges identified
Two types of barriers emerged as main barriers:

1. There are cultural barriers of lacking consumer interest and awareness as well as a hesitant company culture. This finding is at odds with claims that the circular economy concept is hyped; rather, the concept may be a niche discussion among sustainable development professionals.
2. Secondly, market barriers emerged as a core category of barriers, particularly low virgin material prices and high upfront investments costs for circular business models.

Potential actions
Government intervention might be needed to overcome the market barriers, which then may also help to overcome cultural barriers. Cultural barriers also need to be overcome by circular start-ups and, even though there is still no circular start-up that has made global headlines, this may change soon.

8. EEAC (2017) - Europe Goes Circular.

General remarks
The document includes an analysis of and opinions on policy initiatives relating to the circular economy in ten European countries and regions. It is mostly not about locally implementable actions but more aimed at national policy contexts.

Barriers identified

1. The introduction of the CE as a **holistic** approach
2. Mismatch between the CE and consumer behaviour

The transition to a circular economy is in its early phases, which are characterised by emerging alternative visions and growing experimentation. At the same time, the existing systems (waste management, industrial production, fast-paced consumption, industrial food production, fossil energy use) are still predominantly linear and face disruptive and fundamental changes if they become circular.

9. Ellen MacArthur Foundation (2017) - Cities in the CE - An Initial Exploration.

General remarks
This is a first brief on EMF's City research.

Key elements to address in a circular city (preliminary):
- built environment
- energy systems
- urban bio economy
- urban mobility
- production systems

10. Ellen MacArthur Foundation (2015) - Policymaker Toolkit.

General remarks
This report is not aimed at the urban level.

Governance interventions
Three key steps in the transition process are identified:

1. Align on starting point, ambition, and focus. Relevant stakeholders need to be mapped and engaged early on in the process. Based on an understanding of the (national) circularity and policy context, a realistic ambition level and sector scope needs to be defined.
2. Assess sector opportunities. This step can be conducted in parallel sector working groups and relies heavily on the involvement of businesses. The most relevant circular economy opportunities need to be mapped and prioritised. For the prioritised opportunities, a sector-specific economic impact needs to be assessed, barriers limiting their realisation must be identified, and policy options to overcome these barriers should be mapped.
3. Analyse economy-wide implications (described for national context): This step will typically be driven by a core group of policymakers, policy and economics experts, and with the participation of multiple government agencies. The sector-specific impact assessments could be aggregated into one overarching whole-economy impact assessment to support the mandate for policy intervention.

Other interventions mentioned relevant for urban levels:
Industry involvement and cross-government cooperation are crucial.
A sector-by-sector analysis is a good approach to identify the variety of opportunities and challenges involved in transitioning.

11. Ellen MacArthur Foundation & BAM (2017) - Circular Business Models for the Built Environment.

General remarks
This is specifically aimed at CE development within the built environment with a focus on business models.

Rationale behind the report:
'The built environment provides huge opportunities for cities (and business and governments) to play a leading role with realising the CE without having to wait for the transformation of the whole system. The global construction industry is the largest consumer of resources and raw materials of any sector. Fast growing cities have a tremendous opportunity to take advantage of system-level ideas that harness digital technologies to help share vehicles and buildings, track materials and increase access to services. Mature cities also have plenty of scope to improve resource outcomes: 60–65% of European office space, for instance, is under-utilised even during working hours. Applying circular economy principles to the design of urban infrastructure can be foundational to providing cities with inclusive economies that work in the long term'.

Hence, the **governance intervention** would be to begin with the construction sector as it is certain there is opportunity for CE developments independent of the urban context.

12. EMF & Google (2017) - Cities in the circular economy the role of digital technology.

General remarks
The paper explores the role that some aspects of digital technology can play in creating an urban system that is regenerative and restorative.

Digital technology is seen as a critical enabler of CE transitions. Specifically:
- asset tagging
- geo-spatial information
- big data management
- connectivity

Governance intervention
Facilitate and invest in digital infrastructure.

13. European Commission (2014) - Scoping study to identify potential circular economy actions, priority sectors, material flows and value chains.

General remarks
This is a broad EU study on CE potential - not specifically aimed at local/ regional authorities.

Challenges identified
1. Insufficient skills and investment in circular product design and production which could facilitate greater re-use, remanufacture, repair, and recycling;
2. Current levels of resource pricing which create economic signals that do not encourage efficient resource use, pollution mitigation, or innovation;
3. Lack of sufficient incentives due inter alia to the insufficient internalisation of externalities through policy or other measures;
4. Non-alignment of power and incentives between actors within and across value chains (e.g., between producers and recyclers) to improve cross-cycle and cross-sector performance;
5. Still limited consumer and business acceptance of service oriented business models that are potentially more efficient, e.g., leasing rather than owning, performance-based payment models;
6. Limited information, knowledge, and economic incentives for key elements in the supply and maintenance chains, e.g., for repair and reuse, on the chemical composition of certain products such as substances in electronic devices;
7. Shortfalls in consumer awareness (e.g., perishability of food products);
8. Insufficient waste separation at source (e.g., for food waste, packaging);
9. Limited sustainable public procurement incentives in most public agencies (i.e., Green Public Procurement);
10. Insufficient investment in recycling and recovery infrastructure, innovation, and technologies (related to this is the lock-in of existing technologies and infrastructure);
11. Challenges in obtaining suitable finance for such investments;
12. Inadequacies in policy coherence at different levels (e.g., bioenergy and waste policies);
13. Widespread planned obsolescence in products.
14. Many of these barriers are specific to particular materials, products, and sectors requiring different types of action at the EU, national, regional, and local levels

according to the nature of the barrier faced.

No other response actions/ interventions identified than those in previous documents.

14. ESPON, Interact, Interreg & Urbact (2016) - Policy brief on the circular economy: Pathways to a circular economy in cities and regions.

General remarks
This report is aimed at local and regional policy makers on how to foster the CE.

Steps in the transition process identified for local policy-makers (non-hierarchical):

1. Analyse regional and local context - the industrial profile, infrastructure, and accessibility
2. Use smart public procurement
3. Set clear framework conditions - integrate the CE commitment into local/regional strategic documents; setting out priorities, planned measures, and support available. This is useful for the private stakeholders involved as a reassurance of the region's ambitions, enabling them to plan long-term CE activities as well
4. Support local and regional stakeholders with targeted funding, access to knowledge, information and networks opportunities. Yet, before setting up new channels, take a step back to see what is already there to make it easier to reach out to existing networks, if available.

Appendix 13 - Overview of City Development Roadmaps

Supplementary table 20 provides the reading guide for the total list of Circular city development guides. For the analysis, which will be presented in a separate brief, only the dark green (Circular City Strategy Papers) have been included.

Supplementary table 20. Reading Guide City Development Reports

Colour	Type	Description
	City Circular Strategy Paper	City guide outlining urban development strategy that is explicitly circular: targets one or more of the urban CE domains, makes use of one or more of the 7Rs. Clear action points included; planning included.
	City Circular Vision	City guide outlining a vision for *potential* urban development that is explicitly circular: targets one or more of the urban CE domains, describes use of one of more of the 7Rs. No action points included; no planning included.
	City Climate, Smart or Sustainability Strategy paper including CE	City guide outlining a sustainable urban development strategy. The development of a CE is explicitly included as one of the action themes. One or more of the 7Rs are included.
	City Climate, Smart or Sustainability Strategy paper overlapping CE	City guide outlining a sustainable urban development strategy in which CE is not explicitly mentioned. However, one or more of the target domains addressed overlap with CE target domains and one or more of the 7Rs are included.
	City Climate, Smart or Sustainability Strategy paper without CE	City guide outlining a sustainable urban development strategy in which CE is not explicitly mentioned. None of the 7Rs are included.
	Country Circular Strategy Paper	Country guide outlining a nation-wide development strategy that is explicitly circular: targets one or more of the CE domains; makes use of one of more of the 7Rs. Clear action points included; planning included.
	Country Climate or Sustainability Strategy paper in which the CE is	Country guide outlining a nation-wide sustainable development strategy. The

	a theme	development of a CE is explicitly included as one of the action themes. One or more of the 7Rs are included.

This total collection of 48 documents as presented in Supplementary table 21 is based on thorough desk research, and is expected to cover at least a large share of publically available papers and reports. However, it is possible that there are more reports available, which have not been found. Especially reports on 'general' sustainable urban developments are more widespread than what is included here, as the aim was to recover reports specifically aimed at the CE and not general sustainability. Moreover, it might be that there are CE development plans available, which have not been recovered as they are not in English. However, the collection of English CE development plans (and several Dutch reports, due to the researcher's background) is expected to be fairly complete. The low total merely shows that there are not that many available cities concretising their circular development trajectories yet.

Supplementary table 21. Overview of City Development Reports collected

Country	City/ region	Title	Year	Brief description	CE Strategy addressed
Netherlands	**Amsterdam**	Circular Amsterdam. A vision and action agenda for the city and the metropolitan area.	2017	Amsterdam sees itself as a pioneer in the transition to a circular economy. The city guide report identifies areas in which circular developments can be applied and highlights strategies to accomplish practical implementation of these sustainable solutions. Key focus areas: the construction chain and the organic residual chain.	5 out of 7: reuse, repair, repurpose, recycle, up cycle Strong focus on reuse. Redesigning and reducing also addressed.
	Friesland	Circular Fryslan: de economie van de toekomst (Circular Friesland: the economy of the future) (*In Dutch*)	2015 or 2016	Report outlines which themes and activities provide opportunities for the rollout of CE in Friesland. Core themes: agriculture, plastic, organic waste streams, construction, and saline cultivation. Mostly aimed at closing industrial and agricultural loops and making and using bio-based materials.	3 out of 7: recycling, up cycling mostly. Repurposing of buildings.
	Rotterdam	Roadmap Circular Economy Rotterdam	2016	Roadmap for CE development in Rotterdam. Themes: food, urban development/ construction, clean-tech/maritime, medical. Also identification of current barriers and subsequent actions.	4 out of 7: reuse, repair, refurbish, repurpose Strong focus on reuse, refurbishment, repurposing of buildings
	Rotterdam/ the Hague	Roadmap the Next Economy	2016	Roadmap for the region of The Hague and Rotterdam (association of 23 municipalities) aimed at the 'next' economy. Circular economy is considered *part of* this next economy; defined as use and re-use of resources and waste. The other four themes are smart digital delta, smart energy delta, entrepreneurial	3 out of 7: recycling, up cycling mostly. Reuse included as well but more as an umbrella-theme for all strategies than as a distinct approach.

				region, next society (labour market and education).	Also included: redesigning.
Belgium	**Flanders**	Vlaanderen Circulair. Samen naar een circulaire economie (Flanders Circular. Towards a circular economy together) (*In Dutch*)	2017	The key themes for Flanders for 2016-2017 are circular procurement, circular city, and circular entrepreneurship. Flanders aspires full implementation of the CE before 2050; operational goals renewed every six years.	All 7 addressed. No hierarchy but vision that which strategy is needed can differ ("sometimes repair, sometimes recycle is the best option").
	Brussels	Gewestelijk Programma voor de Circulaire Economie (Regional plan for the circular economy) (*In French and Dutch*)	2016	Vision included on built environment, resources, and waste use and management, logistics, trading, and food. Inclusion of legislative and regulatory actions planned.	5 out of 7. Much focus on reusing and repairing. Not explicitly addressed: remanufacturing and repurposing. Redesigning also mentioned.
	Walloon	Walloon Waste-Resources Plan	2017	Circular economy plan largely focused on waste management. Key focus points: use of data management and inspection to reduce violations in relation to waste, prevention of household and industrial waste, management of industrial waste, management of household waste.	2 out of 7: re- and up cycling. --> Mostly Lansink's approach: prevention and reuse of waste, recycling. Reuse from a CE-product perspective not addressed.

Luxembourg	**Luxembourg**	Luxembourg as a knowledge capital and testing ground for the circular economy. National roadmap to positive impacts. Tradition, transition, transformation.	2014	This is a 500+ page report, so not really a City Guide; yet the only available document for Luxembourg and CE. Provides general information on the CE as well as a roadmap for Luxembourg. FocuPotential actions defined for areas: agriculture, automotive, buildings and construction, ICT, metals, logistics, retail, transport, energy and water. Report provides potential courses of action, not an actual roadmap.	Potential for value creation in Lux identified through reuse, remanufacturing, and recycling (3 out of 7).
Denmark	**Copenhagen**	Green Economy Leader Report	2014	Report aimed at identifying strengths of CH as a green economy compared to other cities, examining policy initiatives aimed at strengthening green economy, as well as to identify alternative strategic pathways for future green growth. Themes: low carbon, energy and resources; urban form, transport and accessibility; innovation and business. CE not explicitly included, yet attention for two CE strategies.	2 out of 7: recycling and repairing
Sweden	**Malmö**	STRATEGY PAPER OF MALMÖ TOWARDS A POST-CARBON CITY	2016	Strategy paper on the transition of Malmo to a low-carbon city of which circular economy is an element. Mainly described as facilitating the potential for local companies use CE strategies. CE not addressed as a citywide strategy.	4 out of 7: reuse, repair, refurbish and remanufacture mentioned as opportunities for local business.
	Goteborg	A STRATEGIC CLIMATE PROGRAMME FOR GOTHENBURG	2014	Climate programme aimed at politicians and public officials in the Gothenburg region. Includes 2050 strategy - includes themes of 'smart citizen', resource-efficient urban planning; efficient energy use and conversion to renewables; reduced climate stress from travel and transport. --> Themes overlap with	3 out of 7: reuse, repair and recycle. Reduce also addressed (reduce purchases of resource-intensive goods)

				some of the CE themes, and several CE strategies included. However, CE not explicitly mentioned in itself.	
Germany	**Frankfurt**	Frankfurt Master plan 100% Climate Protection	2017	Aimed at energy mainly - efficiency and renewable energy strategy - mobility also included. CE not a theme.	0
	Munich - Freiham	Sustainable Freiham Objectives, plans and steps of urban planning	2017	Development plan for the new Freiham area: includes visions on urban planning and architecture, mobility, water and soil, biological diversity, emissions, urban climate, energy and economy. No CE strategies included.	0
	Rhineland-Palatinate	Circular Economy State of Rhineland-Palatinate	2008	Brochure aimed at illustrating circular initiatives and developments of CE in the region. No action paper.	2 out of 7: reuse, recycle. Also includes reduce (described as 3R strategy: reduce, reuse, recycle)
	Berlin	Climate Neutral Berlin - 2050		Feasibility study showing that and how Berlin can become climate-neutral in 2050. Includes energy transformation and the topics of traffic, economy, buildings, and consumption but not approached from a CE perspective (only refurbishment 'renovation' of buildings included).	0
France	**Paris**	White paper on the circular economy for greater Paris	2015	CE development plan of the greater Paris region. Includes food and bio-waste, eco-design and green construction, new economies, and reuse/remanufacture/recycle for products, renewable energy, industrial and regional ecology. Includes government actions and regulatory changes to be implemented.	4 out of 7: reuse, repair, re-utilization (repurposing), recycling. Described as core 4Rs.

	Lyon	Experimenting today for better city living tomorrow	2017?	Lyon wants to facilitate the transition to a smart city. This is mainly achieved by promoting and facilitating urban experiments and pilots in the field of energy, mobility, digitalization, and local innovation. Not an explicit CE strategy, however.	0
	Auvergne-Rhône-Alpes	Eclair - Economie Circulaire en Auvergne-Rhone-Alpes	n.d.	Website attributed to region's circular economy efforts rather than a City Guide.	x
	Aquitaine	Recita - Economie Circulaire et Innovation et Aquitaine	n.d.	Website attributed to region's circular economy efforts rather than a City Guide.	x
	Nord-Pas de Calais	Third Industrial Revolution Master Plan	2013	Plan to make the region more resource-efficient, productive, and sustainable. CE not the umbrella-theme but included as horizontal model that underlies Third Ind. Rev. and needs to be adopted in the region. Five core themes: energy transition, land conversion/ bio-restoration, energy storage, energy internet/ smart grids, plug in and fuel cell transport for all four themes.	Also follow 3R principle: reduce, reuse, recycle (2 out of 7)
Spain	**Madrid**	Madrid7R (*in Spanish*)	n.d.	Website attributed to region's circular economy efforts rather than a City Guide.	x
	Catalonia	Catalonia 2020 Strategy	2012	Development strategy for the Catalonian region with six priority areas: Employment and training, Social cohesion, Innovation and knowledge, Entrepreneurism, Internationalisation, Green economy. The last theme is aimed at the use of energy and resources that is more efficient a shift to a sustainable production model. Overlaps with CE domains and includes recycling. Policy developments identified related to resource-	1 out of 7: recycling

				efficiency transition.	
	Barcelona	Barcelona's Commitment to the Climate. Roadmap for 2015-2017	2015	Roadmap until 2017. Climate is the umbrella theme, efficient resource use and zero waste (circular economy theme) mentioned as part of the strategy.	3 out of 7: reuse, repair, recycle
	Valencia	Valencia Smart City	2015	PowerPoint presentation about Valencia Smart City. Part of Climate-Kic Smart City programme. Smart City Strategy aimed at improving environmental quality, foster innovation and entrepreneurship, improve decision-making, improve infrastructure. Improving environmental quality includes renewable energy systems, urban waste management, and climate and water strategies. No CE approach. Even waste management targets incineration and energy generation, not recycling.	0
	Basque Country	Environmental Framework Programme 2020	2014	Document outlining the Basque region's environmental strategy up to 2020 in which the CE is integrated: transformation of the energy model, implementation of the circular economy and mobility are central umbrella themes in which the solutions to the Basque country's environmental challenges are grounded.	2 out of 7: reuse and recycling.
Italy	**Milan**	Strategy paper of Milan towards a post-carbon city	2016	Analysis of current situation and strategy for 2050, six sectors: social issues, mobility and transport, environment, land use, energy, and innovation and technology. Not explicitly called	3 out of 7: reuse, repair, recycle

				CE but overlaps with themes.	
	Prato	New Prato: Smart City	n.d.	Website attributed to region's circular economy efforts rather than a City Guide.	x
	Modena	Modena Energy Roadmap 2014-2050	2014	Roadmap to 2050 - sustainable urban development. Overview of current projects and future themes to be addressed. Overarching theme is energy developments of Modena. Yet includes urban planning, the built environment, mobility and transport, and lifestyle and well-being as well. CE not explicitly mentioned nor strategies identified.	0
	Liguria	Liguria Circular - Documento programmatico Gruppo di Lavoro “Materiali, rifiuti ed economia circolare” (Programme document Lavoro Group "Materials, Waste and the Circular Economy) (*in Italian*)	2015	Action proposals for the Liguria regional government to roll-out CE in Liguria.	3 out of 7: reuse, repurpose, recycle, reduce/ prevent also mentioned
	Genoa	Transformation Agenda Genoa	2014	Smart City Transformation plan. Includes themes energy, mobility, and built environment. No real CE approach; only refurbishment (renovation) of buildings included.	0
Greece	**Athens**	Athens Resilience Strategy	2017?	Programme from Resilient City Project. The items addressed overlap with some of the elements of the CE (green city/ vibrant city items) but not many CE strategies included.	2 out of 7: Reuse and recycling of waste included (not reuse from a product perspective)
Poland	**Krakow**	Kraków in Smart Cities Network	2014	Development potential for Krakow. Targets the themes of smart people, living, environment (including sustainable resource management, development of green areas), smart economy	0

				(local entrepreneurship), mobility (public transport and bike/ pedestrian dev.), and smart governance. No CE strategies included.	
	Poland general (Sendizmir Foundation)	Ecosystem services for sustainable development of cities	n.d.	Ecosystem service approach to urban development as part of Polish sustainable development. No focus on CE. Focus on valuation of ES.	0
Malta	**Malta**	GREENING OUR ECONOMY – ACHIEVING A SUSTAINABLE FUTURE |	2015	Defined as green economy yet largely overlapping with the circular economy. Report: Green Economy is comprised of activities in areas such as renewable energy; energy-efficient products; resource-efficient production techniques; the re-use, recovery and recycling of waste; water management; and low-carbon vehicles. Other themes addressed are agriculture and biodiversity; manufacturing and sustainable production and consumption; and construction, building, and waste. Green economy is seen as a part of sustainable dev. with a strong focus on resource use.	4 out of 7: reuse, repair, refurbish, recycle
Czech Republic	**Prague**	SMART Prague 2014 – 2020	2014	Smart City Development plan for Prague includes the themes of reliable transport friendly to municipal environment; expedient and sustainable management of energy, water supply, and other resources; centre of innovation and skilled labour; promotion of housing market and easy access to housing; transition from mono-centric to a polycentric city; Improved quality of city administration; integration of Prague into the European structures. Not a CE approach, however.	0

Austria	**Vienna**	Smart City Wien	2014	Trajectory includes targets for the themes of Resources (including energy, built environment, mobility and infrastructure), innovation (includes entrepreneurial climate, R&D, education), Quality of living (includes social cohesion, healthcare and green urban environment). Overlap with CE themes but no CEs strategies.	0
Hungary	**Budapest**	Smart Budapest	2017	Smart City approach central in urban development in Budapest. Key themes are Budapest knowledge hub (innovation), sustainable resources (aimed at energy and waste management), mobility, urban environment (green and climate resilience), social partnership and smart economy (among other local entrepreneurship/ business, local food). Overlap with CE themes and inclusion of some CE strategies.	2 out of 7: reuse and recycling.
Latvia	**Riga**	Riga 2030: Sustainable Development Strategy of Riga until 2030 and Development Programme of Riga for 2014-2020	2014	Extensive report outlining the development trajectory for Riga up to 2030. Core focus on mobility and infrastructure development; spatial development of natural territory; effective use of resources and related municipal policy; social development; energy efficiency. No CE approach.	0
Estonia	**Estonia country programme**	Estonian Environmental Strategy		Includes a vision on sustainable use of resources and waste management; preservation of biodiversity; energy and energy consumption. No CE approach.	0

	Tallinn	Tallinn Smart Mobility and Smart Building - Ambition, Vision and Roadmap	2017	Includes two of the CE themes of built environment and mobility with renewable energy and smart data use as facilitating themes (two separate docs) - CE addressed as resource management approach within the themes.	2 out of 7: reuse, refurbish
Finland	**Finland Country Programme**	Leading the cycle – Finnish road map to a circular economy 2016–2025	2016	Finnish roadmap towards a CE: aimed at making Finland the CE frontrunner by 2025. Focus areas: 1) a sustainable food system, 2) forest-based loops, 3) technical loops, 4) transport and logistics, and 5) joint actions. Synergies between these areas will also be taken into account. The actions in the different focus areas of the road map are divided into three levels: policy actions, key projects, and pilots.	All 7 in hierarchical form Including redesign, reduce
	Helsinki	Helsinki City Plan - Vision 2050	2013	Vision for Helsinki in 2050 as a sustainable city. No actual roadmap. No CE approach.	0
Slovenia	**Slovenia Country Programme**	Action Plan Circular Economy 2016-2022	2015	Strategy paper by STRIP, the Slovenian governmental department for strategic research and innovation partnerships on the circular economy transition agenda for Slovenia. Core focus on sustainable biomass transformation and bio-based materials; technologies for use of raw and secondary materials and reuse of waste; and production based on alternative energy sources.	4 out of 7: reuse (of WEEE), refurbish, recycle, up cycle redesigning also addressed
Ireland	**Ireland Country Programme**	Moving Towards the Circular Economy in Ireland	2017	Mainly focussed on identifying Irish CE case studies, inclusion of some recommendations for the transition to the CE but no extensive	6 out of 7: reuse, repair, refurbishment, remanufacturing,

				roadmap. However, inclusion of barriers and roadblocks to CE transition in Ireland including policy recommendations	repurpose, recycle; also reduce, prevention, redesign, recovery
UK	**Brighton**	City Sustainability Action Plan	2015	Plan outlining city's priorities in terms of sustainable urban development. Includes the themes of Zero Waste City (focus on reduce, reuse, recycle principle), zero carbon, sustainable water, materials and transport, local and sustainable food, land/ wildlife protection, culture and community and equitable, locally thriving economy and, finally, health and happiness. Very similar to CE plan	5 out of 7: Reuse, repair, refurbish, remanufacture, recycle Also: reduce (3R)
	London	London's circular economy route map	2015	Aimed at the built environment, food, textiles, electrical and plastics	5 out of 7: reuse, repair, refurbish, remanufacturing, recycle Also: redesign, reduce
Scotland	**Glasgow**	Circular Glasgow - A vision and action plan for the city of Glasgow	2016	Report for the Glasgow City Council made by Circle Economy identifying action points for the transition to the CE. Mostly specific action points linking resource/wastes streams of businesses.	Industrial symbiosis plan - linking sectors in the city. No 7R strategies explicitly mentioned. Incl: recovery (of heat), recycling of waste streams
	Scotland Country Programme	Making things last	2016	Plan sets out priorities for moving towards a more circular economy. Focus on four areas: food, drink and the bio economy; remanufacturing, construction and the built environment; energy infrastructure. Horizontal theme: waste prevention and efficient resource use	6/7: reuse, repair, remanufacture, repurpose, recycle Also incl: redesign, reduce