Exploring circular economy imaginaries in European cities

A research agenda for the governance of urban sustainability transitions

Fratini, Chiara Farné; Georg, Susse; Jørgensen, Michael Søgaard

Published in:
Journal of Cleaner Production

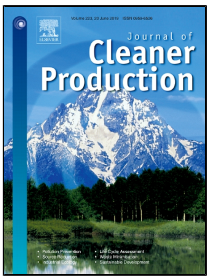
DOI (link to publication from Publisher):
10.1016/j.jclepro.2019.04.193

Publication date:
2019

Document Version
Accepted author manuscript, peer reviewed version

Citation for published version (APA):
Fratini, C. F., Georg, S., & Jørgensen, M. S. (2019). Exploring circular economy imaginaries in European cities: A research agenda for the governance of urban sustainability transitions. *Journal of Cleaner Production*, *228*, 974-989. https://doi.org/10.1016/j.jclepro.2019.04.193

Accepted Manuscript



Exploring circular economy imaginaries in European cities: a research agenda for the governance of urban sustainability transitions

Chiara Farné Fratini, Susse Georg, Michael Søgaard Jørgensen

PII:	S0959-6526(19)31280-6
DOI:	10.1016/j.jclepro.2019.04.193
Reference:	JCLP 16549
To appear in:	*Journal of Cleaner Production*
Received Date:	11 July 2018
Accepted Date:	16 April 2019

Please cite this article as: Chiara Farné Fratini, Susse Georg, Michael Søgaard Jørgensen, Exploring circular economy imaginaries in European cities: a research agenda for the governance of urban sustainability transitions, *Journal of Cleaner Production* (2019), doi: 10.1016/j.jclepro.2019.04.193

Exploring circular economy imaginaries in European cities: a research agenda for the governance of urban sustainability transitions

Chiara Farné Fratini [1*], Susse Georg[1], Michael Søgaard Jørgensen[1]

[1]*Center for Design, Innovation and Sustainable Transitions (DIST), Department of Development and Planning, Aalborg University, A.C. Meyers Vænge 15, 2400, Copenhagen SV, Denmark*

[*]*Corresponding author, chiff@plan.aau.dk*

Exploring circular economy imaginaries in European cities: a research agenda for the governance of urban sustainability transitions

Keywords: circular economy, urban sustainability transitions, socio-technical imaginaries, co-production, governance, geographies of transition, Europe

Abstract

This paper builds on the following research questions: 1) How is circular economy imagined in the academic literature in support of sustainability transitions in European cities? 2) How do European cities imagine circular economy as a knowable object of governance? 3) How can the circular economy imaginary be an opportunity for socially inclusive and environmentally desirable urban transitions? We engaged in a three-fold research endeavour to address these questions. Firstly, we conducted an in-depth literature review, mapping the emergence and developments of the circular economy concept in time and space with a specific focus on urban studies. Secondly, we analysed documented translations of the circular economy imaginary in three European metropolitan cities (Amsterdam, Paris and London) to explore the discourses, institutions, representations and social identities underpinning their respective translations, and reflect on how they diverge from each other and how they have the potential to deliver sustainable outcomes. Thirdly, these results were used to outline a research agenda that explores the relationship between the political and the epistemic domain of existing urban translations of circular economy across scales and places, to support future empirical investigations of whether and how circular economy imaginaries can support transformative pathways for socially inclusive and environmentally desirable value creation in cities. In so doing, this paper fosters reflexivity for both theory and practice in order to better understand how theorisations and the application of circular economy could be advanced in support of urban sustainability transitions.

1 Introduction

Circular economy has become a widely popular concept, promoted by practitioners within business, such as business consultancies (McKinsey Center for Business and Environment, 2016), business associations (e.g. World Business Council for Sustainable Development, 2017) and business foundations (Ellen MacArthur Foundation, 2015; Carlsberg Group, 2016), and it is increasingly embraced by policy makers internationally and nationally. Circular economy is, for instance, being debated in reports published by the World Economic Forum (e.g. World Economic Forum, 2014), and it currently informs not only EU policy (European Commission, 2015) but also municipal and city policies (e.g. City of Amsterdam, 2016). The question of how circular economy is adopted in urban contexts is subject to increased attention in the otherwise burgeoning literature on circular economy (Prendeville et al., 2018). This coincides with a growing interest in, and research into, the role of cities in promoting sustainability transitions (Bulkeley et al., 2010; Hodson & Marvin, 2010; Fratini and Jensen, 2017). Emphasis in such studies is on the spatial context and place-making dynamics of sustainability transitions, that is the local sociotechnical and institutional contingencies that shape transition pathways and related governance issues. For some authors, informed by insights from Science and Technology Studies (STS) science and technology are not simply seen as embedded within the social; but science, technology and the social are considered mutually constitutive, i.e. co-produced (Jasanoff 2004; Latour 1993; 2004).

While there are long standing interests in the role of cities in promoting sustainability transitions, relatively little attention has been given to understanding the interrelationships between urban sustainability transitions and circular economy. Although the relationship between these two bodies of literature is alluded to, it is often not explicated. This article juxtaposes insights regarding circular economy and co-productionist approaches (Jasanoff, 2004; Voss and Freeman, 2016) to urban development with the aim of furthering our understanding of the opportunities and challenges of working with circular economy in cities. On the base of a literature review and three case studies we develop a research agenda for advancing existing knowledge about how to govern the circular economy for urban sustainability transitions in Europe.

1.1 Circular economy as a socio-technical imaginary

Over the past decade there has been a dramatic increase in the number of published papers – in scientific journals and the popular press – on the importance of 'closing the loops', and developing a 'sharing economy' and a 'circular economy'. Circular economy is also increasingly used as the overarching strategy of municipal, regional and international plans to foster sustainable transformations and support the development of a green economy. Much has been written about the 'lineage' of the circular economy concept, and the different schools of thought – ecological economics and general systems theory – that provide the intellectual grounding for thinking of the economy as a circular system (Ciraig, 2015; Ghisellini et al., 2016, Ellen MacArthur Foundation, 2015), and how circular economy also relates to phenomena such as industrial ecology (Frosch and Gallopoulos, 1989; Graedel, 2000), the performance economy (Stahel, 2010), product-service systems (Tukker, 2015), cradle-to-cradle design (McDonough and Braungart, 2002), and the sharing economy (Cohen and Muñoz, 2016). There is also an extensive literature on the principles of circular economy, the core of which relates to the 3Rs: reduction, reuse and recycle (Ghisellini et al., 2016, p. 5).

At the same time, the concept of circular economy is criticised for lacking a strong scientific basis, as "created mainly by practitioners, the business community and policy-makers" (Korhonen et al., 2018, p 45) and for being "over-hyped, scarcely investigated and therefore as yet ill-defined" (Prendeville et al., 2018, p 172). In order to support a better understanding of the development and stabilisation of the circular economy concept, we offer another perspective with the intention of establishing a constructive bridge between scientific and practice-based knowledge. In so doing, we suggest that conceptualisations and operationalisations of circular economy are inevitably influenced by geographically and culturally contextualised "socio-technical imaginaries", i.e. "collectively held, institutionally stabilised and publicly performed visions of desirable futures, animated by shared understanding of forms of social life and social order attainable through, and supportive of, advances in science and technology" (Jasanoff and Kim, 2015, p 120). The process of theorising, applying and mainstreaming the circular economy therefore requires careful investigation and reflexivity from scientists, practitioners and policy makers.

A sociotechnical imaginary projects new goals and development paths that depart from the existing, and when it comes to circular economy this is often cast as replacing the linear production-consumption model of take-make-use-dispose by 'closing the loops' (Lieder and Rashid, 2016). A sociotechnical imaginary can also simultaneously single out and legitimise particular 'solutions' precisely because of the promises the imaginary holds (Borup, et al. 2006), such as industrial symbiosis, cradle to cradle design, materials recycling, resource recovery and waste minimisation; and extended product life. According to the co-productionist argument, however, the form and power of a sociotechnical imaginary depends on its 'fit' with existing material infrastructures, social norms and structures, and political institutions. This, then, speaks for contextualised accounts of the uptake

of the circular economy imaginary. Whilst, much of the research on sociotechnical imaginaries has focused on developments in nation states (Jasanoff and Kim, 2009; 2015), in what follows, we focus on cities, and on how knowledge on circular economy has been translated into sociotechnical imaginaries with the potential for socially inclusive and environmentally desirable urban transitions.

1.2 The governance of urban sustainability transitions and the circular economy

In parallel to the fast-growing interest in the circular economy concept, we are witnessing increasing attention on the role of cities in facilitating societal transformations to more sustainable production and consumption patterns (Vergragt et al., 2016). In light of meagre results with regard to sustainable urban transformations, however, there is growing discussion about the need for changing the governance practices and business models of urban utilities to increasingly integrate demand- side dynamics and facilitate changes in urban lifestyles and consumption patterns. Cities are largely recognised as growth engines, which can easily lead to unsustainable development if not properly monitored and assessed; but at the same time cities are often acknowledged as productive places for experimentation with alternative modes of public governance and service provision. The rapid growth of the urban population nevertheless introduces a number of additional environmental challenges, such as resource scarcity, pollution, and aging infrastructures. Vergragt et al. (2016, p 11) show that "transitions towards sustainable consumption and production can hardly be imagined to be driven by one actor alone; but necessitate the collaboration of many. Grassroots innovations, government programs, a growing sense of responsibility among corporations, consumers and science all play important roles in changing institutional structures within the major domains of energy housing, food, waste and transport as well as macro foci on economic growth and consumerism. (…) If the ambitious dream of multi-level change towards sustainable consumption and production is to become reality, sustainability debates have to move beyond academic circles and reach a wider audience, ranging from urban planners, across businesses, educators and NGOs to, not least, the individual 'consumers' in cities". Consequently, studying the governance of urban sustainability transition become imperative.

As Frantzeskaki, Broto, Coenen, & Loorbach (2017) emphasise, however, much of the research into sustainability transitions has paid relatively little attention to the role of space and place, thus limiting our understanding of the geographically uneven developments of urban transitions today. In particular, they demonstrate that urban sustainability transitions are empirically and theoretically distinct from sector-specific transitions, as they necessitate the alignment of resources and actor constellations across a number of systemic domains within a given geographical and socio-material setting. Studying sustainability transitions in urban contexts therefore inevitably contributes to an identification of shortcomings in the existing literature on transition studies, thus contributing to the further development of this research field. Urban contexts are, indeed, characterised by both the emergent varieties and spatial proximity of systems, strategies, practices, institutions and technologies, and therefore, are inevitable loci of creative potential for knowing and undertaking transition governance beyond incumbent domains, and for capturing and understanding the situated politics of sustainability transitions in the making (Grin et al., 2017).

Relatively little attention has hitherto been paid to understanding the interrelationships between urban sustainability transitions and the circular economy. We believe that cities represent a particularly productive geography in which to study how a socio-technical imaginary, such as that of the circular economy, is co-produced and, therefore, how it can be governed to drive sustainability transitions in urban contexts. This paper juxtaposes insights regarding circular economy and co-productionist approaches to understanding urban transitions with the aim of furthering insights into the opportunities and challenges of working with circular economy in cities.

1.3 Aim and research questions

Our research interest draws towards understanding those situated processes that are co-producing governance concepts, such as 'circular economy', which have potential for driving changes in urban contexts. Previous studies on sustainability transitions in cities (e.g. Fratini & Jensen, 2017; Georg, 2015; Jensen, Lauridsen, Fratini, & Hoffmann, 2015) demonstrate how knowledge and power are inevitably interlinked in the governance of urban transformations. Jasanoff (2004, p. i) shows how "scientific knowledge both embeds and is embedded in social identities, institutions, representations and discourses".

Inspired by Voss and Freeman's (2016) book on "knowing governance", which focuses on the epistemic construction of political order, we would like to draw attention to the interrelationships between the politics of urban change, and the ways and places in which knowledge about governance concepts, such as that of circular economy, evolve and stabilise. We agree with Stirling (2016, p. 259). that "knowledge of all kinds is necessarily value-laden – not least in the knowing of governance. (…) The question is therefore not about whether any given effort at knowing governance is normative, but what this normativity is – and in what ways this is explicitly accountable".

The aim of this study is, therefore, to understand how cities in Europe, both as actors and places, co-produce the circular economy imaginary. The article builds on the following research questions:

1. How is circular economy imagined in the academic literature, in support of sustainability transitions in European cities?
2. How do European cities imagine a circular economy as a knowable object of governance?
3. How can the circular economy imaginary become an opportunity for socially inclusive and environmentally desirable urban transitions?

As a final outcome, we propose a research agenda for further studies into how circular economy is being/has been translated into sociotechnical imaginaries and how these translations embed particular forms of social-political 'order' with varying potential for socially inclusive and environmentally desirable urban pathways. Inspired by Stirling (2016), we believe the more ambitious the transformative tasks are, the more asymmetrically power tends to be distributed in the search for a higher degree of control over uncertainties, with potentially negative implications for democratic accountability. Avoiding such predicaments requires "more direct co-ordination among ambiguously apprehended pluralities of knowing, valuing and imagining" (ibid, p 268). Our research seeks to encourage the democratic accountability of circular economy implementations in European cities by drawing attention to the ways in which urban imaginaries of circular economy are co-produced, and to how processes of knowledge co-production about the circular economy may limit or silence the diversity of contextual interpretations, possibly contributing with "tension between transformation as a progressive end and democracy as a progressive means"(Stirling 2016, p 268). Drawing on these insights, and from urban sustainability transition studies, we therefore argue for:

- Broadening social appreciations of the potentialities of the circular economy imaginary for progressive urban transformations;
- Opening the spaces for political actions across scales and sectors;
- Supporting urban actors in "letting go" of overly standardised and centralised material commitments to urban circularity in favour of greater diversity and flexibility in the development of effective strategies, practices, institutions and technologies in between place-making and functional transformations.

2 Material and methods

This study is organised as a three-fold research design. We first conducted a literature review to map the emergence and developments of circular economy imaginaries, with a specific focus on studies carried out on, and with relevance for, urban contexts. Secondly, based on an analysis of policy documents (e.g. plans, white papers, policy briefs, etc.), we explore how circular economy is interpreted in three European metropolitan cities – Amsterdam, Paris and London. Thirdly, case descriptions document the need for further exploring the uptake and use of circular economy imaginaries in urban policy. To this end, we outline a number of guiding questions regarding the socio-material arrangements, processes of knowledge co-production and normative dimensions of circular economy, with the intent of building a research agenda that can support transition pathways for socially inclusive and environmentally desirable value creation in cities.

2.1 Literature Review

The literature review seeks to document how the circular economy imaginary is applied to urban contexts. The aim is to understand the interrelationship between the rapidly developing research field underpinning the concept of the circular economy, and current debates regarding the way it is translated in cities, especially with regard to sustainable outcomes. We performed the literature search using Scopus as the main search database, because it includes contributions from the social sciences, which are less well-represented in, for example, Web of Science. To begin with, we undertook a general search on papers about circular economy, obtaining 1990 hits, which were then refined as follow:

1. We only considered papers published in the last 16 years, 2001-2017: 2001 is actually the year in which the concept of circular economy started to appear in the academic literature included in Scopus (see Figure 1);
2. We favoured peer reviewed sources such as journals and book chapters;
3. We only selected articles written in English and focussed on the post-industrial context. This means that publications from China and other non-post-industrial countries were excluded, even though roughly one third of the available literature on circular economy focuses on China (see Figure 2). This is presumably a consequence of the Circular Economy Promotion Law of the People's Republic of China, which was adopted in 2008 and came into force on 2009 (World Bank Group, 2017). Our research aims to unpack the co-production of knowledge and politics characterising governance processes for the translation of circular economy in cities with relevance for Europe, and therefore, a focus on post-industrial democratic contexts was considered appropriate.
4. Papers from chemistry/biochemistry, biology, pharmacology/toxicology, veterinary, mathematics, immunology, medical, computer and material sciences were excluded.
5. By reading the abstracts, we selected articles focusing on governance issues. We refer to "governance" in a broad sense, as political and institutional processes involving knowledge and power, as in Leach, Scoones, and Stirling, (2010).

Each article selected was then analysed according to the objectives of our enquiry. Based on this characterisation, a systematic analysis of the material was carried out to characterise the chronological and geographical development of the circular economy concept. Among the selected articles, we particularly focused on publications discussing sustainability (sustainab*), transitions (transition*) and focusing on cities (urban OR city OR cities OR metropol*). Additional papers, which were not caught by the search strategy, were selected using a snowballing procedure, as in Geissdoerfer, Savaget, Bocken, and Hultink (2017), by searching through the reference lists and the citing authors of the papers selected in Scopus.

To conclude, 99 papers were selected as the core data of our academic review. Our sample should probably be compared to a sample targeting different type of databases and a larger variety of geographical perspectives. In addition to our sample, we have also relied on key policy documents to take into account framings of the circular economy developed by international governmental and non-governmental organisations such as the World Economic Forum, Ellen Macarthur Foundation, and European Commission.

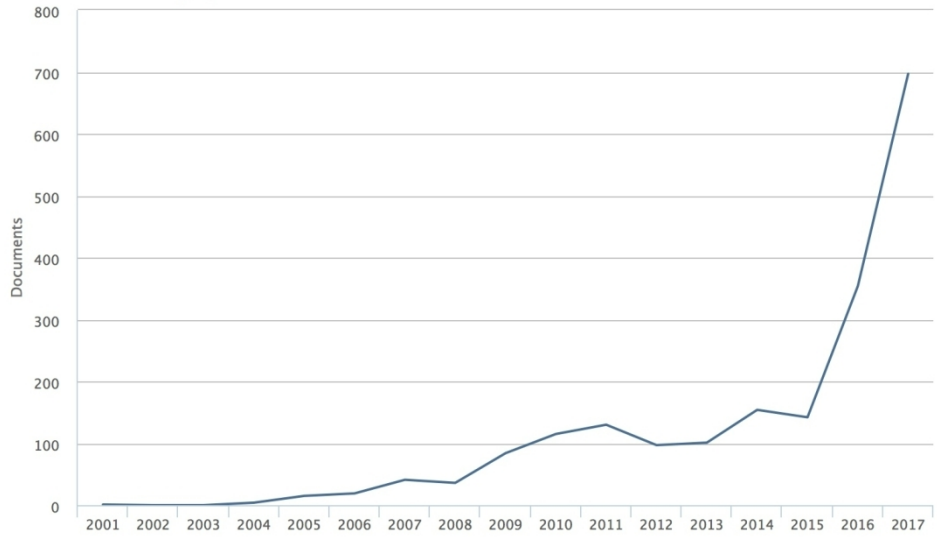


Figure 1. Documents by year on the circular economy in Scopus. The graph was created through the analysis of search results for the introduction of "circular economy" in SCOPUS over time (Copyright © 2018 Elsevier B.V.). It is clear that concept use started around 2001 and 2003 and that its use has increased drastically in the last 6-7 years, with a steep proliferation of publications from 2015.

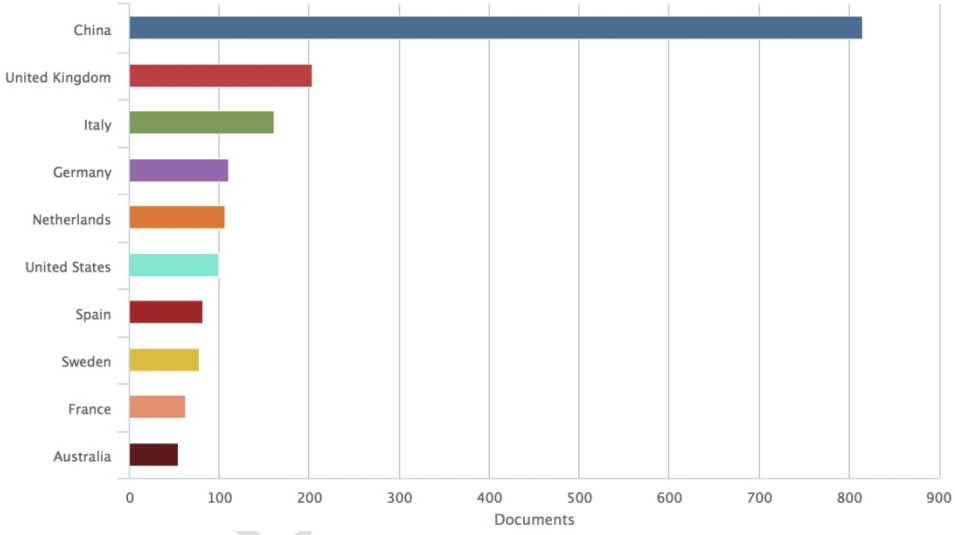


Figure 2. Documents on circular economy by country in Scopus. The graph was created by comparing the number of publications produced on "circular economy" by country in SCOPUS (Copyright © 2018 Elsevier B.V.). The result shows clearly how there are many more publications from China than from other countries. To be precise in Scopus there are 816 publications specifying China, compared to a total of 1990 publications on "circular economy".

2.2 Case study design

Our explorative case study aims to better understand which governance arrangements are supported by urban imaginaries of circular economy, and which governance arrangements circular economy imaginaries are being supported by. In particular, our intention is to understand how knowledge about

circular economy is being co-produced, translated and made visible by situated public authorities with the ability and capacities to drive local urban transitions and to inspire circular urban imaginaries across the world. Because of our cultural and geographical proximity, we decided to focus our study on European cities, and specifically on those cities that have flagged themselves as being at the European forefront in the translation of circular economy within urban contexts. We specifically selected three cities that, given their prominent visibility as international metropolises and their global networks, are more likely to influence knowledge co-production on urban circularity at both local and global scales. These cities are Amsterdam, Paris and London.

These three cities differ on two central counts: 1) population size - Greater London has 8.6 million, Greater Paris has 6.9 million and Amsterdam has 840 thousand people; 2) economic structure – London has seen a major shift towards professional and business service activities after an important market decline in manufacturing; Paris' economy is characterised by a strong tertiary focus, but also the presence of important companies within the fields of aeronautics/aerospace, information technology, communications, and bio-technology; and Amsterdam is the financial and business capital of the Netherlands and the fourth largest port in Europe.

Despite their differences, these three metropolises have some similarities: All three are capitals of important European economies – the Netherlands, France and Great Britain – and have purposively chosen circular economy as a productive imaginary with which to drive and shape urban transformations in the making, proposing themselves as frontrunners on national, European and global scales. They can thus be considered "extreme cases" (Flyvbjerg, 2006) of capital cities that have actively and explicitly engaged in contributing to the development and advance of the circular economy. Each city is actively engaged in documenting their situated knowledge co-production processes in the form of planning, policy and technical documents. As a consequence, the findings emerging from studying these three extreme cases will be a source of inspiration and, therefore, have relevance for other European cities, where circular economy imaginaries are also being co-produced to support transformative actions.

2.3 Analytical framework

In order to analyse circular economy conceptualisations in the scholarly literature (Research Question 1) and critically reflect on the socio-technical imaginaries underpinning circular economy translations in Amsterdam, London and Paris (Research Question 2), we have adapted the conceptual framework of "knowledge co-production" introduced by Jasanoff (2004). The results of this analysis were used to develop a research agenda to support future studies and reflect on how circular economy might provide opportunities for socially inclusive and environmentally desirable urban transitions (Research Question 3). Our intention is to enable discussions about how different translations of circular economy in cities are co-produced in between the epistemic and the political domains characterising situated practices of urban governance. To this end, Jasanoff's (2004) work presents a productive framework, providing us with a comprehensive and critical viewpoint from which to study circular economy imaginaries and their manifestation. Studies of co-production are characterised by two components: 1) "constitutive" studies, exploring how new phenomena come into being and stabilise, and 2) "interactional" studies, unfolding the controversies and transformations arising within established political and epistemic orders, especially when their boundaries and qualities are being reimagined and renegotiated (Pfister, 2016).

From the constitutive perspective, this study aims to analyse the emergence and stabilisation of a new socio-technical imaginary, the circular economy, to re-configure the socio-economic life of cities towards a more sustainable social order. Enhanced circularity in the management of urban systems and resource flows has the potential to radically change the production and consumption patterns

characterising and sustaining today's urban systems and life-styles. If implemented poorly, however, despite scientifically compelling arguments, the circular economy concept could lose credibility and risk being seen as a buzzword or as greenwashing. Seen from an interactionist perspective, therefore, the emergence of circular economy as a socio-economic order with which to organise cities provides a great opportunity to study how processes of legitimisation and operationalisation of circular economy take place within specific urban configurations, and how these processes have the potential to contribute to sustainable outcomes. In analysing the constitutive and interactional processes of co-production, Jasanoff (2004) identified four elements that contribute to sustaining social order morally, ontologically, politically, and symbolically: discourses, institutions, representations and identities. Below we introduce each of the four elements to clarify how they are used in the analysis.

Discourse analysis is widely used in the social sciences and aims to unfold the ways in which languages, concepts and systems of meaning are created, and to study the different ways of structuring areas of knowledge and social practice. In this study we focus on practices related to the circular economy. In particular, critical approaches to discursive practices describe the ways in which discourses are shaped by power relations and ideologies, to unfold the constructive effects that discourses have upon social relations, identities, beliefs and systems of knowledge, none of which are generally apparent to discourse participants (Fairclough, 1992).

Institutions are defined as "cognitive, normative, and regulative structures and activities that provide stability and meaning to social behaviour. Institutions are transported by various carriers – cultures, structures and routines – and they operate at multiple level of jurisdiction" (Scott, 1995, p. 33). Institutions are multifaceted and able to incorporate symbolic systems. In so doing, they are enabling the creation, maintenance, travel, transformation and eventually the disruption of discourses. At the same time, discourses may also have the power to create, transform and maintain institutions. One way to assess the stabilisation of a specific discourse is thus to study the way it is inscribed and de-inscribed in those institutions forming the basic structures or building blocks of social order. For the purpose of this study, we will refer mostly to institutions or institutional structures to identify the regulative structures affecting processes of urban transformation and influenced by circular economy imaginaries. The cognitive structures will instead be investigated through the concept of representations, and the normative structures through the concept of identities. Both concepts are described below.

Representations are epistemic and figurative elements which are created and stabilised through discourses and institutional structures, and that because of their objectification can be conveyed through space and time. "Order can thereby be stabilised when certain concepts, symbols, and material objects have become symbolic representations for particular aspects and visions of society and when they are distributed and adopted widely enough" (Pfister, 2016, p 78), and therefore "making representation is about making and disseminating anchors of stability" (ibid). The exploration of representations in this study will identify the cognitive structures which underpin circular economy in the different cities. For example, the so-called "butterfly model" (Ellen MacArthur Foundation, 2015, p. 20) is one of the most common epistemic representations of the circular economy. The focus of our study will be the ways in which specific representations, such as that of the butterfly model, are introduced, described and applied in each city case.

Identities are analytically connected with discourses, institutions and representations. Adding "identities" as an analytical object helps reflect on co-production processes in relation to situated social norms representing specific groups, communities and their situated histories, which contribute to shaping and at the same time are being shaped by, the discourses, institutions and representations involved in the making of circular economy imaginaries. Given that this is a desktop study, we do not

have in-depth data to determine how situated urban identities in each case might affect collective imaginations of circular economy within the politics of the city, but local identity features emerge from the analysis of each case and therefore provide some clarification on how and why circular economy is being described and organised differently in each case.

3 Results and analysis

3.1 Academic imaginaries of circular economy for urban sustainability transitions

Discourses on circular economy appears to hold much promise for urban sustainability transitions. According to recent publications from the Ellen MacArthur Foundation (2012; 2013; 2014; 2015; 2017), the circular economy is a way of "rebuilding capital", whether this is financial, manufactured, human, social or natural. It will thus ensure enhanced flows of goods and services through the re-design of business and development models following three basic principles: 1) Preserve and enhance natural capital by controlling finite stock and balancing renewable resource flows; 2) Optimise resource yields by circulating product components and material at the highest utility at all times, in both technical and biological cycles; 3) Foster system effectiveness by revealing and minimising negative externalities. The circular economy is consequently described as "a continuous positive development cycle that preserves and enhances natural capital, optimises resource yields, and minimises system risks by managing finite stocks and renewable flows" and more, it is expected to "works effectively at every scale" (Ellen MacArthur Foundation, 2015, p. 19). Accordingly, the European Commission's Action Plan for the Circular Economy set very high expectations: "The circular economy will boost the EU's competitiveness by protecting businesses against scarcity of resources and volatile prices, helping to create new business opportunities and innovative, more efficient ways of producing and consuming. It will create local jobs at all skills levels and opportunities for social integration and cohesion. At the same time, it will save energy and help avoid the irreversible damages caused by using up resources at a rate that exceeds the Earth's capacity to renew them in terms of climate and biodiversity, air, soil and water pollution. (…) Action on the circular economy therefore ties in closely with key EU priorities, including jobs and growth, the investment agenda, climate and energy, the social agenda and industrial innovation, and with global efforts on sustainable development" (European Commission, 2015, p.2).

Nevertheless, Ghisellini et al. (2016), point out how publications inspired by the Ellen MacArthur Foundation celebrate the circular economy as "an alternative growth discourse" rather than an "alternative to growth discourse". They argue that this is a critical shortcoming, given earlier framings of the economy as a circular system based on limited resources (Pearce and Turner, 1990; Boulding, 1996); Ghisellini et al. (2016) thereby call for the alignment of the circular economy discourse with de-growth and steady state economics, rather than with the predominant neoclassical framings on economic growth. Hobson and Lynch (2016, p. 15) also consider the alignment of circular economy with the economic growth discourse as problematic, because of "its inability to address many deeply embedded challenges around issues of consumption and the consumer, echoing as it does the problematic (and arguably failed) agendas of sustainable consumption/lifestyles". Valenzuela and Böhm (2017) warn against purely functional interpretations of the circular economy (e.g. zero-waste discourses), as this might result in its de-politicisation, as it is often the case for "growth capitalism" discourses.

Similarly, Gregson et al. (2015) identify three critical elements characterising European discourses on the circular economy: 1) technocratic: the technical dream of perfect circularity via perfect recovery, which might be a somewhat utopic achievement; 2) geographical: global recycling

networks are considered the wrong form of resource recovery because they are supported by unprotected labour working in socially and environmentally degrading conditions in the Global South to benefit of the Global North; 3) economic: the EU discourses on circularity build on the expectation that a European circular economy can respond to critical EU resource demands through secondary resources;, for example, there are 14 raw materials, which feature on the high supply risk list for EU economies and that at present can only be supplied by China at a high cost. On the base of the three critical points, Gregson et al. (2015, p. 221) argue that "the actuality of forging circular economies within the EU entails challenges born of conjunctures of politically created markets, material properties and morally defined material circuits".

Representations of 'the' circular economy come in many forms, shapes and sizes: geometric representations (e.g. circles, cradle to cradle and loops) and biological representations (e.g. symbiosis and metabolism). Of all these, the cradle to cradle, closed loops and the Ellen Macarthur Foundation's butterfly representations of circular resources flow are the most predominant in the academic literature. They represent what is described as highly efficient and virtualised closed loops which can reduce the demand for natural resources and material input by recovering, reusing, and recycling those input and resources as an integral part of the production process. In their article about circular economy business strategies, Bocken, de Pauw, Bakker, and van der Grinten (2016) characterise circular economy through three different representations of strategic actions in relation to resource flows: 1) Slowing resource loops through the design of long-life goods and product-life extension; (2) Closing resource loops through recycling; (3) Narrowing resource flows by using fewer resources per product.

Little attention is paid in the scholarly literature to the analysis of social ***identities*** and ***institutions*** and the transformational dynamics in translating circular economy discourses and representations into political action. Similarly, not much attention is given to the active role that public authorities and citizens can play. Institutions set the rules of the game, influencing expectations, values and actions, and determining the spectrum of economic activities. Understanding institutions contributes to unfolding knowledge about who bears the costs of externalities; the social (e.g. inequalities) and environmental impacts (e.g. air and water pollution). Institutional structures, and legislation in particular, delineate the costs that economic activities must be held accountable for and thus effect profitability and competitiveness. According to Moreau et al. (2017), circular economy exemplifies the essential role that institutions can play in distributing costs among economic agents instead of transferring them to the environment. The lack of fundamental analyses of the social contexts (including social identities) and institutional conditions under which circular economy is being implemented is therefore considered an important barrier to its contributions to socially just and environmentally desirable societal transitions (Moreau et al., 2017; Korhonen et al., 2018).

A few scholars (12 references in total) emphasise the role that cities (and particularly municipal administrations/administrators) can play in translating the circular economy into political action, for example, as brokers and/or facilitators working to close the loops through, again for example, waste management and 'mining' activities. Within the scholarly imaginations of circular economy, cities are described as productive places for developing new urban identities and institutions, with the purpose of closing loops, being smarter and creating competition, and in which the circular economy is a post-crisis reaction to foster socio-technical innovations in support of economic growth. Cities are also seen as breeding grounds for new discourses on circular economy via the creation of/association with newly emerging discourses such as those related to the "sharing economy" (Cohen and Muñoz, 2016) and the "settings of hope", i.e. the creation of laboratories for resilience (Meerow et al., 2016). In general, cities are seen as pre-existing places, containers in which the system of

meanings related to the circular economy imaginary and its epistemic domains unfold and align with pre-existing dynamics.

Very few articles go into much depth when discussing "how" and "what it takes" to implement circular economy principles in cities and urban contexts in general. There are a few prescriptive articles, emphasising what cities are doing and/or could do, for example, describing the emergence (and diversity) of sharing activities in cities and their contribution to a transformation of urban economies (Cossu and Williams, 2015), or proposing eco-cultural innovations in neighbourhood-based activities that reinforce the local economy or introduce small-scale technology for water, renewable energy or waste (Dieleman, 2013). Ghisellini et al. (2016, p. 11) suggest that "CE comes from the involvement of all actors of the society and their capacity to link and create suitable collaboration and exchange patterns (…) [and] point out the need for an economic return on investment, in order to provide suitable motivation to companies and investors". Hobson (2016, p. 99) proposes a designer-consumer-user-repairer-citizen contract "where roles, competencies and responsibilities are redistributed and reconfigured throughout the lifetime of products and services, recalibrating the social relations and arrangements that currently favour the purchasing-ownership-disposal model of citizen-consumer practices". Gutberlet (2015, p. 29) presents cooperative recycling as "a form of organized urban mining", which generates "an obvious, short to long term, win-win situation for communities, governments, urban miners/recyclers, and the environment".

Uyarra and Gee (2013, p. 101) show how governance challenges to implement zero-waste strategies in the city of Manchester were overcome "by a mix of political vision, stakeholder engagement, economies of scale, and the ability of waste disposal managers to gather expertise, resources, political influence and commitment at multiple levels of governance". Furthermore, "the case shows how system innovations are triggered by external pressures and incentives which are felt differently at different times and in different places; how they are driven by collective visions of sustainability mediated by unique, place-specific urban conditions such as political culture, resources, existing infrastructure and local path-dependencies and how they are conditioned by different abilities to reconfigure socio-technical infrastructure through the mobilisation of resources and actor networks internally and across governance scales"(Uyarra and Gee, 2013, p.109). Prendeville et al. (2018) warn the academic community of a few governance challenges regarding the translation of circular economy imaginaries in cities: 1) policymakers rely too much on businesses to drive implementation, therefore, preferring to use affordable experiments and business incentives, including collaboration platforms, financial mechanisms and knowledge development approaches; 2) the role of citizens and communities are generally valued but there appears to be a mismatch in how these stakeholders are involved in building circular city imaginaries; 3) too much emphasis is placed on major urban stakeholders and on digital and data-driven approaches. According to Prendeville et al. (2018), if the circular economy is to be a productive concept driving processes of urban sustainability transitions, then the scientific community has to consider what a sustainable circular city entails, and provide clear guidelines and advice to policymakers on how to address these issues. Their conclusion is that "a circular city is a city that practices [circular economy] principles to close resource loops, in partnership with the city's stakeholders (citizens, community, business and knowledge stakeholders), to realize its vision of a future-proof city" (Prendeville et al., 2018, p. 188). None of the six city cases that Prendeville et al. (2018) analysed, however, seem to have the appropriate institutional setting to do so. Marin and De Meulder, (2018) compared "four contemporary forward-looking spatial representations of 'circular' places" and demonstrated that each of the four cities developed their own imaginary of urban circularity. They came to two important conclusions: 1) multi-dimensional spatial circularity requires combinations of a diversity of sustainability framings; and 2) circularity representations always conceal politics that are driving place-making urban transition agendas.

There are no other studies in the field of circular economy which analyse discourses, institutions, representations and identities in relation to the governance of circular economy in urban contexts. The following sections seek to contribute to this by analysing three situated circular economy imaginaries in three European metropolitan cities: Amsterdam, Paris and London.

3.2 The circular economy imaginary in Amsterdam

The development of the circular economy imaginary in Amsterdam go hand in hand with the development and stabilisation of the "smart city" and the "sharing economy" imaginaries. Dutch environmentalism and expectations for ecological modernisation seems to underpin knowledge co-production on the Amsterdam circular economy imaginary, borne out by increasingly institutionalised national regulations aimed at the Green Economy, such as the "Green Deal". Emphasis is primarily given to resource flows, job creation, sectorial transition and innovation through strategic niche management aimed at re-framing three main socio-technical regimes: waste, energy and construction (with specific focus on building materials). The government and municipality are described as facilitators of circular resources flows. Assessment methods for the ecological and economic impacts of the circular economy are discussed, together with the identification and introduction of ad-hoc indicators. Consumption patterns still play quite minor role in the Amsterdam's circular economy strategy. Although the impacts of consumption on sustainability transition patterns are acknowledged, their resolutions are nevertheless identified among the aims of the "sharing economy" plan, without, however, specifying how they are being addressed. Despite identifying clear links between the circular and the sharing economy imaginaries, the two agendas remain largely independent of each other, the former being driven mostly by the public sector and the latter mostly by private actors and NGOs. This produces an apparent disconnect between consumption and production patterns, resulting in consumption being more or less rendered invisible in the circular Amsterdam imaginary.

3.2.1 Discourses

The long-term ambition of "Gemeente Amsterdam" (i.e. the City of Amsterdam or Amsterdam Municipality) is to develop a new method of production, distribution and consumption by encouraging innovation, research and new practices while recovering resources through the separation of 65% of household waste by 2020. It is expected that "the ability to identify and implement circular solutions at the city level will lead to job creation, a cleaner environment, new or rejuvenated industries, and competitiveness in global markets. The circular economy provides solutions for many environmental, economic and geo-political challenges that cities worldwide are facing" (CIRCLE et al., 2015).

An analysis of the opportunities, commissioned by the municipality and developed following the "Circular City Scan approach", identified where and how to begin implementing circularity, and what impacts in terms of jobs, environmental improvements and added value can be expected. The results suggest that "Amsterdam has the potential to greatly reduce greenhouse gas emissions and material consumption while, at the same time, realising economic growth and stimulating employment opportunities. The economic activity of the Amsterdam metropolitan region amounts to 106 billion euro annually, of which 47 billion is accounted for by the City of Amsterdam" (CIRCLE et al., 2015).

In order to reach these goals, the City of Amsterdam has committed itself to the following six principles (City of Amsterdam, 2015):

1. No waste: all materials will end up in an infinite technological or organic cycle
2. Energy will be entirely derived from renewable sources.
3. Natural resources will generate new financial or non-financial gains.
4. System adaptability will be supported by modular and flexible product design and supply chains

5. New business models for production, distribution and consumption will be developed in order to transition from possession to the use of services
6. Human activities will contribute to eco-system services and to the rebuilding of 'natural capital'.

In parallel to its commitments to become a circular city, the City of Amsterdam has committed to transitioning to a "sharing city", which means "encouraging activities in the sharing economy that will benefit innovation, social inclusiveness, entrepreneurship and sustainability" (City of Amsterdam, 2016). The city's commitments to a sharing and a circular economy are framed in parallel but described as independent processes. On the one hand, the circular economy agenda only briefly mentions sharing as a strategy and only in relation to product use (e.g. cars) and not as an integral part of a systemic change. On the other hand, the Sharing Economy Action Plan, published by the City of Amsterdam (2016), makes no references to the circular economy. The sharing activities are identified as products of a business-driven digital platform, independent of interventions of the public authorities; "the sharing economy is not a question of banning or authorizing, but of monitoring and seizing opportunities where possible" (City of Amsterdam, 2016).

Another discourse associated with the circular economy is the depiction of Amsterdam as a "smart city". The term "smart" appears 18 times in the city action plan "Towards the Amsterdam Circular Economy" (City of Amsterdam, 2012) and 62 times in the document "Circular Amsterdam - A vision and action agenda for the city and the metropolitan area" developed by Gemeente Amsterdam in collaboration with CIRCLE Economy and FABRIC TNO (2015). The future of a Circular Amsterdam is indeed expected to result in "smart designs" of, for example, energy systems and resource use.

3.2.2 Representations

The core element in the City of Amsterdam's circular economy representations is the localisation of resource flows to minimise the importation of basic resources and materials and, therefore, make Amsterdam (and the Netherlands in general) as independent as possible from the global resources market: "It is called 'circular' because scarce natural resources are recovered and used to generate new financial or non-financial gains. This requires new production, consumption, regional distribution, local distribution and logistics models, to accelerate the transition from 'possession' to the 'use' and 'sharing' of products" (City of Amsterdam, 2015). The localisation of resources is to be organised in six cycles: Food, Phosphate, Waste, Water, Electricity and Heat.

The key words and strategic representations used when describing the way each system will be transformed are: 1) consume less, e.g. meat, energy and water; 2) recover where possible basic materials and resources from waste flows - e.g. recover fertiliser from composting food or phosphate from sewage water; 3) decentralise systems, e.g. sanitation systems, to recover phosphate or the energy system for renewables, based on the production and efficient use of electricity/heat; 4) develop reward systems for citizens/households for, for example, waste separation, water use minimisation and lowering peak energy demand.

In order to accelerate the transition to a circular economy, the City of Amsterdam has commissioned a systemic analysis of the sectorial domains in which to focus investments and actions. The Circular City Scan method, carried out by Circle Economy and TNO Fabric, has identified two value chains as having the highest transition and value creation potential: the "construction chain" and the "organic residual stream chain" (CIRCLE Economy et al., 2015).

3.2.3 Institutions

The City of Amsterdam (2012) has developed an inspirational booklet entitled "Towards the Amsterdam Circular Economy" to portray the current and desirable future cycles for food, phosphate,

waste, water, electricity and heat. This programme was carried out as a collaboration between the City of Amsterdam's Environmental and Building Department (Dienst Milieu en Bouwtoezicht, or DMB), the Department of Physical Planning (Dienst Ruimtelijke Ordening, or DRO), the Water Utility Company (Waternet) and the Waste and Energy Company (Afval Energie Bedrijf, or AEB). The City of Amsterdam is described in this program as one of the actors within an organisational agenda that has a multilevel nature, composed of six levels: Global – National – Metropolitan – City – Neighbourhood – Dwelling.

Circular economy initiatives are supported by the "Green Deal" as part of a national ambition to make the Netherlands a "Circular Hotspot". The Green Deal programme is developed as a joint initiative between the Ministries of Economic Affairs, Infrastructure and the Environment, and the Interior and Kingdom Relations, and is regulated by a board comprised of businesses, non-governmental organisations (NGOs) and government. Its aim is to address a number of non-financial barriers for circular initiatives in order to create a protected space for economic activities, to stabilise and scale up circular innovation after their initial success.

In most of the documents consulted, the City of Amsterdam is depicted as a pioneer in the transition towards a circular economy at the metropolitan level, so as to become an example for the rest of the world. There is, however, very little discussion of the effect that circular economy activities have on the urban fabric, on place-making. The prime focus appears to be on closing resource flows, and not on changing innovation and consumption practices by prolonging product life times and, thereby, slowing down the resource flows. Public authorities are depicted as facilitators who can minimise regulatory barriers to the urban transition to a circular economy. The Municipality of Amsterdam is depicted as the main organisational facilitator and sponsor in order to create the newly designed circular market through public procurement and the creation of new markets though the commodification of recovered resource/waste flows.

3.2.4 Identities

The circular city programme, organised by the Municipality of Amsterdam, appears to be driven by the ecological modernisation agenda inspiring the Dutch "Green Deal Approach", which is promoted by the government of the Netherlands. The Dutch Green Deal Approach has a strong focus on green growth and the transition to a sustainable economy and aims to create new opportunities for innovative initiatives promoted by businesses, NGOs and citizens through the "removal of obstacles in law and regulations" and by creating access to networks and launching strategic market incentives (Government of the Netherlands, 2016).

On the one hand, attention to the sharing economy seems to be driven by the interest of the City of Amsterdam to capture local green identities, emerging from ongoing bottom-up activities already happening at the city/neighbourhood level,, for example, car-pooling, and repair cafes. On the other hand, the circular urban agenda is characterised by expectations for changing local identities and consumption patterns through "a shift from possession of goods to (use of) services" which is expected to be enabled by the development of new business models for production, distribution and consumption (CIRCLE et al, 2016). It remains unclear, however, how these green identities carried through the "sharing city" imaginary will be linked and integrated into the systemic and growth oriented "circular city" imaginary.

"Smart" identities are being created or supported by existing strategic niche activities related to the making of the "Amsmarterdam" city in which "circular economy" is listed as one of the strategies for developing a smarter city. In this context, the focus is mostly on innovative solutions/products for supporting the making of urban circularities.

3.3 The circular economy imaginary in Paris

The circular economy imaginary in the city of Paris is being used as a unifying vision aimed at improving social cohesion while legitimising Greater Paris as the administrative institution for the Paris metropolitan region. Core elements of the Greater Paris circular economy imaginary include activities supporting low-income actors by promoting a social and solidarity economy, the localisation of production systems, educational programmes and opportunities for learning aimed at the development of common regional identity. The core material aspects are: waste, energy, climate, product design, environment. The circular economy imaginary in Paris is being co-produced with the involvement of a large variety of both public and private actors engaged in elaborate participatory processes, facilitated by the public authorities, who are in charge of policy interventions and the provision of financial support for the implementation of circularity in specific urban systems and networks. Consequently, the circular economy imaginary in Greater Paris is profiled somewhere in between the "alternative to growth" and "alternative growth" discourses to brand the region, on the base of synergies across social, political and economic interests and dynamics.

3.3.1 Discourses

The Circular economy in Paris is framed as "the first stage in the fight against climate change" (Mairie de Paris and ADEME, 2016, p.3). The aim of circular economy in Paris is "to preserve the planet and its inhabitants using a socially centred approach, and build a world that is at once more ecological, more equitable and more united" (ibid). The Parisian translation of the circular economy is described as a "new business model that respects the environment, protects the common good, and creates jobs (…). A model that is based on sharing rather than profit, collective intelligence rather than individual competition, recovery rather than waste" and where the final goal is to "uncouple economic growth and the consumption of natural resources" (Mairie de Paris and ADEME, 2016, p. 4).

The circular economy imaginary in the metropolitan area of Paris is "a collective and unifying political horizon" (ibid) in the creation of the Greater Paris region. This might also explain the extensive focus on territorial social cohesion. Moreover, it appears that the Paris Climate Conference COP21, held in December 2015, was a prime motivational factor for developing the program. This explains the alignment of the circular economy imaginaries with discourses related to climate mitigation and adaptation in the metropolitan area. The circular economy is presented as a regional strategy "to take into account the realities of energy, raw material and travellers flows" within Greater Paris, while at the same time producing new activities and jobs (Mairie de Paris and ADEME, 2016, p. 4).

3.3.2 Representations

The circular economy imaginary of Greater Paris is underpinned by seven pillars which are expected to help local actors "to uncouple economic growth and the consumption of natural resources" (Mairie de Paris and ADEME, 2016, p. 6): sustainable supply, eco-design, industrial and regional ecology, product-service system, sustainable consumption, extending the duration of use (through re-use, repair, and re-utilisation), and recycling.

Building on these seven pillars, the White Paper (Mairie de Paris and ADEME, 2016) is described as the first strategic step towards developing the Greater Paris region's circular economic model. This work is organised around eight working groups aimed at developing strong networks for envisioning and then co-creating opportunities for actions: 1) Food, from urban agriculture to bio-waste; 2) The fight against food waste, awareness-raising and redistribution; 3) Planning, from eco-design to green construction; 4) New economies, performance and re-use; 5) From eco-design to end of life, products

with short lives (everyday products); 6) From eco-design to end of life, products with medium or long lives (equipment); 7) Development of recoverable energy; and 8) Industrial and regional ecology.

The work undertaken in these groups has resulted in a set of recommendations, which compile 65 initiatives, within seven strategic areas: 1) Encourage and support economic players; 2) Innovate and experiment; 3) Scale up and establish momentum in the region; 4) Change attitudes and practices; 5) Involve local authorities, businesses and citizens; 6) Create a network linking players; 7) Change the legislation.

3.3.3 Institutions

The White Paper on the Circular Economy of Greater Paris is informed by the European Commission initiatives: "Towards a circular economy: A zero waste program for Europe" and "The Roadmap to a Resource Efficient Europe", which outline the major strategies to be implemented by 2050.

The strategies proposed in the White Paper were addressed to the public decision-makers of the Parisian metropolis, as well as to economic actors and citizens. Co-organised by several local authorities within the Île-de-France region at the initiative of the City of Paris and supported by the ADEME regional office, a General Assembly was launched on March 11, 2015. Its purpose was to bring together a wide spectrum of players (government authorities, businesses, associations, NGOs, academia, research, etc.) to develop opportunities for the implementation of a circular economy in the Greater Paris Metropolis. The eight working groups listed above gathered more than 240 people, representing over 120 different organisations, among which were "local authorities, citizens and players that are active in the economic, associative and academic sectors, in order to advance a new regional project" (Mairie de Paris and ADEME, 2016, p. 4).

Responsibility for implementing the strategies appears to be distributed amongst the different actor categories. Great emphasis is given to bottom-up initiatives, carried out on a volunteer basis, demonstrating great interest in developing an inclusive circular economic model. This is largely based on integrating principles of the sharing economy with the public authorities' facilitating role in ensuring a large integration of citizens. What could be gained from the proposed interventions in terms of business and job-creation, however, is not made explicit. Businesses have, nevertheless, taken an active part within the working groups in charge of developing these strategies. Large corporations responsible for the management and operation of urban infrastructures, in particular, were well-represented in the process.

The Greater Paris region is described as "the voice and testing ground of France" with respect to the implementation of the Circular Economy imaginary. Each local authority is expected to examine the feasibility of the proposed initiatives, further refine them and transform them into a local roadmap. They are also advised to collaborate with the European Union, the French State and regional economics, associative and academic players. Local authorities are thus envisaged as both regulators and facilitators, as the driving forces of the implementation process.

It is not clear whether there will be a radical transformation of public policies to facilitate the implementation of circular economy, but the following policy documents are noted as enablers for the implementation of the proposed initiatives and strategies:

- Circular of January 10, 2012 concerning the obligation for major producers to separate bio-waste at its source. One of the consequences was that by January 1, 2016, mass catering establishments generating more than 10 tons of bio-waste per year were required to sort and recover such waste through composting or anaerobic digestion.
- Decree of October 10, 2007: "Determination of the terms and conditions for the selective door-to-door collection of household and similar waste"

- ORDIF (2014) Management of Household and Similar Waste in Île-de-France in 2012
- The energy transition law, adopted by the French National Assembly on July 22, 2015, includes, for example, a minimum percentage of recycled paper in stationery items purchased by government departments: 25% as of 2017, 40% in 2020.
- Reduced VAT in effect for the variable portion of the rate applied to heating networks, supplied by renewable and recoverable energy at a percentage exceeding 50%. The fixed portion of the rate already stands at 5.5% (identical to the other energies).
- In 2015 France passed a "pioneering" food waste bill which requires large supermarkets (> 400 sq m of retail space) not to discard food approaching its best-before date but to donate it to charity or to turn it into animal feed or compost. Non-compliance can cost supermarkets penalties of up to 75000 euros or two years in jail (Samuel, 2015).

3.3.4 Identities

According to a study carried out by APUR – Atelier Parisien d'URbanisme (2017) on the implementation of the circular economy imaginary in Greater Paris, it is clear that the concept of circularity is strongly interconnected with social, inclusive and collaborative values, and the intention is not just that of "closing the loop" in regional production and consumption practices but to institutionalise shared and unifying civic identities with the aim of creating a stronger sense of belonging to the Greater Paris Region. The ultimate beneficiary is the consumer and the inhabitant. The aim is to create a variety of new and alternative services. The White Paper (Mairie de Paris and ADEME, 2016) emphasises creating new service systems with the aim of supporting community based activities through eco-design, urban agriculture, food (re)distribution, re-use, repair, recover and recycle, under-graduate and professional education, skills swaps, Fab-labs, co-working and office sharing.

3.4 The circular economy imaginary in London

The circular economy in the city of London aims to keep products, components and materials at their highest use and value at all times, to offer significant opportunities for growth that companies realise by retaining the value of products and materials circulating in the economy. It is a product-oriented approach aimed at facilitating the design and production of "low-carbon goods" in support of the transformation of the energy and waste socio-technical regimes. The London approach to the circular economy is developed around five types of business models - product as service, renewable inputs, recovering end-of-life values, prolong product life, and a sharing economy - and is being facilitated by two central authorities – the London Waste and Recycling Board (LWARB) and the Greater London Authority (GLA) – in collaboration with actors from business and academia. Little emphasis is placed on the role of institutions and social identities in support of the transformations needed to achieve promises of increased circularity in Greater London. Business remains the core beneficiary of the circular city strategy.

3.4.1 Discourses

The Mayor of London has asked the LWARB to develop a roadmap for the implementation of the circular economy for Greater London by 2036. In developing the roadmap, the LWARB and GLA were largely inspired by the Ellen MacArthur Foundation framework and network.

The central motivation for undertaking a circular economy approach to infrastructure planning in the city of London is to tackle problems emerging as a consequence of a rapidly growing population and the incredible flux of international visitors:, for example, inefficient use and management of

resources, price volatility, supply risks, degradation of natural resources, urbanisation, the impact of disruptive socio-technical innovations (London Waste and Recycling Board, 2015).

The circular economy is presented as an alternative to traditional linear economic models, based on resource exploitation, and it is defined (London Waste and Recycling Board, 2015) as a framework that:

- "aims to keep products, components and materials at their highest use and value at all times"
- "offers significant opportunities for growth that companies realise as a result of retaining the value of products and materials circulating in the economy"

The strategy is also inspired by Lacy and Rutqvist's (2014) book "Waste to Wealth: The Circular Economy Advantage" and, subsequently, the circular economy imaginary of London has a strong focus on the virtualisation of the waste sector.

3.4.2 Representations

Inspired by Lacy and Rutqvist (2014)'s book, strategic actions are framed around five business models:

1. Sharing economy – sharing assets via sharing platforms
2. Prolonging product life – through the maintenance, design for durability, re-use and remanufacture of products and components
3. Recovering value at end-of-life – through effective recycling and composting
4. Renewable inputs – by using secondary materials as the input for products
5. Product of services – sell access to products while retaining ownership of assets or dematerialisation

The implementation of circular economic principles is expected to benefit London to an approximate annual amount of £7 billion by 2036 and to create over 40,000 new jobs. These benefits were calculated by examining developments in five main areas: 1) the built environment; 2) the food sector; 3) the textile sector; 4) computer, electrical and electronic equipment; 5) the plastic sector. These five focus areas for action have been identified on the basis of their environmental impacts, their retained financial values and potential for re-use and, therefore, waste minimisation.

"Adoption rates" for new business models are applied for each focus area. These measurements are expected to be "the starting point for discussing a circular economy in London. This is the first time a high-level analysis across data sets has tried to quantify net benefit in London" (London Waste and Recycling Board, 2015). A lack of data with regard to commercial consumption patterns, innovation and waste generation, however, is expected to limit the scope of the analysis. Thus, "to develop this work further, [LWARB and GLA] would need to acquire or create new data sets, and further investigate the full supply chain for each focus area, including stakeholder engagement" (ibid). Central targets for measuring progress in the transition to a circular economy are (London Waste and Recycling Board, 2015):

- The number of new jobs and training opportunities for Londoners.
- The number of circular business start-ups and of traditional businesses transitioning to a circular business model.
- The number of circular economy demonstration projects.
- The rate of product recycling, sharing, re-use and remanufacture in the specific focus areas
- The number of GLA group procurements that use circular economy principles.
- The contribution to the greenhouse gas emissions reduction targets in London.

3.4.3 Institutions

LWARB's roadmap identifies five sectors with opportunities to enable the circular economy. These are digital, finance and services, media, higher education, and government. Working groups have identified a number of strategic actions for each of these sectors, which include smart technologies, innovation and knowledge creation, the development of venture capital fund to back circular economy business in collaboration to private sector partners, procurement policies to support new circular markets, and targeted policies and tax reforms at both UK and EU levels.

In order to adopt a circular economy business model, the strategy for a circular economy is organised into three levels for action: 1) start-ups supported by incubating new businesses; 2) scaling-up by providing support to the already large and young SME community; and 3) systemic transition by supporting training and network opportunities

The LWARB and GLA have worked with stakeholders mostly from business and academia. It is not clear whether citizens and NGOs organisations are involved in the process. The role of the GLA is seen as that of supporting market development and innovation through public procurement, venture capital and awareness raising.

The roadmap was developed for use in a participatory process organising the participants into working groups, one for each focus area. Many of the stakeholders involved were already working on circular economy business models within these focus areas. The aim is to bring these experiences "to inform the development of new policy in London and may shape the future direction of the new Mayor's Environment Strategy, London Plan, Economic Development Strategy and Transport Strategy" (London Waste and Recycling Board, 2015).

The transition to a circular economy is expected to take place mostly through changing business models, but public procurement is also seen as a key instrument with which to scale up the transformation. The GLA has thus developed a Responsible Procurement Policy, which mostly focuses on minimising excess through reuse, recycling and "encouraging the procurement of goods derived from natural sources". There are plans to review the Responsible Procurement Policy inspired by the Dutch Green Deal Approach to Circular Procurement.

3.4.4 Identities

Three social groups are placed at the centre of the circular transformation by the LWARB and GLA: the "finance community", the "young" community of start-ups and SMEs, "community gardens" and universities. The values associated with the shift to a circular city in London are "creativity", "innovation" and "entrepreneurship" (London Waste and Recycling Board, 2017). Nevertheless, "business" is the central keyword of the circular economy imaginary in London. The term is, indeed, mentioned 168 times in London's circular economy route map (London Waste and Recycling Board, 2017).

1 **Table 1. Summary of findings: discourses, representations, institutions, and identities characterizing knowledge coproduction on circular economy in urban contexts.**

	Scholar literature and policy documents	Amsterdam	Paris	London
Discourses	▪ Three basic principles: 1) preserve and enhance natural capital; 2) optimize resource yields; 3) foster system effectiveness ▪ Positive development cycle working effectively at every scale ▪ Alternative growth vs alternative to growth discourses ▪ Three critical aspects: technocratic, geographical, economic (resource demand vs secondary resource availabilities)	▪ Extensive associations with the smart city ▪ Central goals: green growth, reduction of greenhouse gasses and material consumption, localization of resources flows, job creation ▪ Strong focus on sectorial transition and innovation ▪ Weak focus on change in consumption patterns ▪ Six principles: 1) No waste; 2) 100% Renewable Energy; 3) Financial/non-financial gains from natural resources; 4) Modular and flexible product design and supply chains; 5) Transition from possession to use of services; 6) Rebuilding of 'natural capital'	▪ In between "alternative to growth" and "alternative growth" ▪ "socially centred approach" ▪ "sharing rather than profit" ▪ "a collective and unifying political horizon" ▪ Central goals: ecological transformation, social equity, social cohesion, job creation, ▪ Strong focus on: climate mitigation and adaptation and solidarity	▪ Strong focus on "smart" business ▪ "Waste to wealth" ▪ To tackle problems related to rapidly growing population and flux of international visitors ▪ Alternative to traditional linear economic models ▪ Opportunities for growth
Representations	▪ Geometric (e.g. circles, cradle to cradle and loops) ▪ Biological (e.g. symbiosis and metabolism) ▪ EMF's butterfly model (resource loops virtualization) ▪ Three strategic actions: Slowing, Narrowing, Closing,	▪ Localization of resources ▪ Six resource cycles: Food, Phosphate, Waste, Water, Electricity and Heat ▪ Key strategic transformations: 1) consume less, 2) recover; 3) decentralize, 4) develop reward systems ▪ two value chains having the highest transition and value creation potentials: construction and organic residual stream ▪ Closing material cycles	▪ Uncouple economic growth and natural resources consumption ▪ Narrowing, Slowing, Closing ▪ Eight working groups: Food, planning, New Economy, from eco-design to end of life, Development of recoverable energy; Industrial and regional ecology. ▪ 65 initiatives, within 7 strategic areas: 1) Encourage and support economic players; 2) Innovate and experiment; 3) Scale up and establish momentum in the region; 4) Change attitudes and practices; 5) Involve local authorities, businesses and citizens; 6) Create a network linking players; 7) Change the legislation	▪ Five business models: sharing economy, prolonging product life, recovering value at end of life, renewable inputs, product of services ▪ Five main areas: 1) the built environment; 2) the food sector; 3) the textile sector; 4) computer, electrical and electronic equipment; 5) the plastic sector ▪ Central targets: jobs and training opportunities, start-ups and transitioning businesses, demonstration projects, product recycling rate, sharing, re-use and remanufacture in the specific focus areas, public procurement, reduction greenhouse gas emissions
Institutions	▪ Supporting regulations to re-distribute costs of externalities across economic agents instead of the environment ▪ The need for the combination of a diversity of sustainability framings ▪ Systemic circularity might obscure place-making urban transition dynamics. ▪ Too much reliance on businesses ▪ Role of citizens not properly integrated ▪ Too much emphasis on major urban stakeholders and on digital/data-driven approaches	▪ The Green Deal ▪ 6 organizational levels: Global, National, Metropolitan, City, Neighbourhood Dwelling ▪ Multi-stakeholder programme: business, NGOs, Government ▪ Regulations to address non-financial barriers (mostly aimed at easing stringent regulations – e.g. food hygiene for long term use) ▪ Strategic niche management ▪ Change in waste fees ▪ Market for local biomass and secondary materials ▪ Public procurement as market creation ▪ Public authorities as facilitators	▪ Multi-stakeholder planning and networking (240 people, 121 org): assembly, working groups involving citizens, NGOs, business, utilities and public authorities. ▪ Large representation of corporate and incumbents actors ▪ Greater Paris Regional administration as driver ▪ Greater Paris as a testing ground. ▪ Fab Labs and co-working ▪ Education and skills swap ▪ Enabling policies: Change in waste fees, food waste for charity mandatory, public procurement, door-to-door waste collection, the energy transition law ▪ Ultimate beneficiary is the consumer and the inhabitant	▪ Five sectors with opportunities: digital, finance and service, media, higher education, and government. ▪ Strategic actions: smart technologies, innovation and knowledge creation, the development of venture capital fund, procurement policies, targeted policies and tax reforms ▪ Three levels for action: 1) start-ups; 2) scaling-up; 3) systemic transition. ▪ Roadmap to be used in a participatory process ▪ Transition driven by business models change and public procurement ▪ LWARB and GLA (public authorities) as drivers
Identities	n/a	▪ Local green identities ▪ National identity for the green Dutch transformation ▪ Sharing city: changing consumption patterns through "a shift from possession of goods to (use of) services" ▪ Smart city ("Amsmarterdam")	▪ Social, inclusive and collaborative values ▪ Circular economy as a vision for unifying civic identities and creating a stronger sense of belonging to the Greater Paris Region. ▪ Global visibility as the host of COP21	▪ Central keyword: "business" ▪ Values "creativity", "innovation" and "entrepreneurship" ▪ Central social groups: "finance community", the "young" community of start-ups and SMEs, "community gardens" and universities

2

4 Cross-cutting analysis and discussion

Circular economy imaginaries demonstrate interpretative flexibility over time and space. The last decade has seen a dramatic increase of publications on 'circular economy', recognising the need to develop new policies, technologies and methods for stakeholder involvement. Very few articles go into much depth on the interrelationship between circular economy and the institutional dynamics underpinning urban transformations, however. Emphasis is given, instead, to prescriptive approaches underpinning expectations for innovation and growth and where circular economy appears to be used as a 'branding' label for things that urban actors have been working on for some years. Much of the literature focuses on Chinese cases of technical approaches to managing resource flows. The implementation of the circular economy concept in post-industrial contexts remains largely un-explored. Little attention is given to the way visions and institutional structures, needed to translate the circular economy into effective political action, are co-produced, or to the active role that urban administrations can play. Table 1 summarises the findings of our analysis of knowledge co-production about circular economies in the scholarly literature, and in the three city cases.

It is clear that Amsterdam, Paris and London have engaged in quite different translations of the circular economy imaginary as their engagement with circular economy has aligned to pre-existing political and institutional arrangements.

The circular economy imaginary in Amsterdam is largely being used as an opportunity for ecological modernisation, very much in line with the ongoing constitutive process of national identity, presenting the Netherlands as a "hot bed" of technological innovations in support of green growth through increased productivity and more job opportunities based on an efficient use of resources. The City of Amsterdam also states quite clearly that a transition to a circular economy will enable the city to localise production and minimise resource dependency from other countries. Although the city plan mentions an intention to decrease and change consumption patterns, it is not clear what is being done to make this happen. For example, why are strategies for the sharing economy not properly integrated into the circular economy action plan?

Paris uses the circular economy imaginary as a unifying political vision on which to base the legitimation of a newly established authority to govern urban development processes beyond municipal jurisdictions. For this purpose, the transition to a circular economy in Greater Paris largely focuses on building social capital and organisational capacity for territorial and social cohesion, involving a large variety of actors. Given the strong focus on socially inclusive and collaborative values, social cohesion becomes an important indicator for the assessment of impact of the circular economy imaginary being co-produced in Greater Paris, however, it remains unclear how this transformation will be able to disrupt the path-dependency of traditional socio-technical regimes and give space to public service regimes built on socially inclusive and collaborative values, when private incumbent actors have a dominant role in the co-production of the circular economy imaginary.

In London, the transition to a circular economy is primarily left in the hands of businesses, the financial sector, and two public authorities, the London Waste and Recycling Board (LWARB) and Greater London Authority (GLA). It is not clear whether or how citizens and NGOs are going to be involved in the transition process. The role of the public authority, GLA, is seen as that of supporting market development and innovation through public procurement and by engaging suppliers and raising awareness on business opportunities.

None of the three cases seems to engage with reflections about and/or measures to regulate processes of commodification of urban flows and materials (e.g. waste), which might de-politicise

infrastructures, urban spaces and services if not properly reflected, organised and regulated. Nor do any of the three cases directly address issues of consumption dynamics, although product sharing is mentioned as a strategy in all three cities and the repair of products is part of the strategies in Paris and London. None of the three cases appears to consider possible rebound effects. According to Zink and Geyer (2017), "circular economy rebound occurs when circular economy activities, which have lower per-unit-production impacts, also cause increased levels of production, reducing their benefit". Mechanisms that cause circular economy rebound effects include a limited ability of secondary products to replace primary products, and a diversity of unpredictable effects on prices, often stimulating increased consumption. Possible strategies to avoid circular economy rebound effects will probably be unattractive to for-profit firms. Zink and Geyer (2017) therefore conclude that "simply encouraging private firms to find profitable opportunities in the circular economy is likely to cause rebound and lower or eliminate the potential environmental benefits".

There is very little reflection in either the scholarly or grey literature on how the circular economy might have effects on social and environmental justice in cities. For example, if secondary products - such as repaired and reused products - are successfully introduced to the market as cheap products available to those who generally cannot afford primary ones, will that result in the stimulation of new material needs? Or will that result in higher prices of primary products - for example, to compensate for lower sales or for higher raw material prices - thus, making them affordable only to a minor, richer part of society with effects on social stratifications? Urban imaginaries of circularity might also run the risk of underestimating how the commodification of waste and product lifecycles can impact both environmental and social justice. If, for example, waste becomes a valuable resource then why stop producing it? Or why engage in sharing? On a general note, how can we be sure that circular urban pathways are not counterproductive to the ontologies built into the circular economy imaginaries being co-produced?

The governance challenges identified in the circular economy imaginaries of the three cities analysed confirm the conclusions by Prendeville et al. (2018), that too much emphasis is given to the role of business and smart, digital and data-driven technologies; too little emphasis is given to the inclusion of citizens and communities; and that too much emphasis is given to major incumbent actors. Our analysis also identifies two other concerns for the viability of circular economy thinking, which might risk jeopardising the legitimacy of the endeavour: the small amount of attention given to understanding and redirecting existing consumption patterns; and, the lack of attention to methods for participatory processes in the co-production of the socio-technical imaginaries of urban circularity.

We believe that durable transformational journeys require engagement with place-making dynamics rather than trying to contain them in discrete and sectorial framings, as in the case , for example, of the Amsterdam circular imaginary. Socially and environmentally just urban transformations require a better understanding of the relationship between goal-oriented systemic journeys and the inclusion of the diverse expectations emerging from engagements with situated processes of co-creation. Sensitivities for the complex geographies of urban transformations enable the coproduction of balanced and just circular urban pathways in between place-making and functional innovations.

5 Conclusions and research agenda

Governance of urban sustainability transitions that can provide just, equitable and more environmentally sound futures, calls for new strategies. Seeking to develop a circular economy may be one of these strategies.

In considering circular economy as a sociotechnical imaginary, the purpose of this paper is to address questions of how circular economy and urban sustainability transitions are, on the one hand, imagined in the academic literature, and, on the other hand, translated into policies and actions in three specific cases. This analysis was hinged on a co-productionist approach emphasising the need to pay close attention to the discourses, institutions, representations, and identities that shape and are shaped by the ways in which circular economy imaginaries are developed, mobilised, and operationalised in different contexts. The reported study is, however, an exploratory one, calling for further research that pays careful attention to the knowledge co-production processes associated with the use of circular economy imaginaries in urban transitions: the inclusion/exclusion issues and actors that this involves, and the local social, economic and political conditions shaping and being shaped by the introduction of these imaginaries. The three cases suggest that there is more research to be done on what urban actors actually do when using circular economy to transition their cities. Further research into the circular economy needs therefore to consider the complexities and practices of urban sustainability transitions. The next few paragraphs highlight a number of issues and questions, which can mark the contours of a research agenda on circular economy with relevance for the governance of urban sustainability transitions.

Our research shows that in-depth research into the knowledge co-production involved in the governance of the circular economy and on its impacts on processes of urban transformation is needed. Although, there are many products and systems characterising what a circular economy involves, within technical research, there is a dearth of results when it comes to understanding the social dimensions that are crucial for the legitimacy and uptake of the various ways of going circular. Future research has to move beyond these highly scientised and technologised approaches to circular economy, focusing on particular products or industries, and to a much lesser extent on cities. These are necessary, but not sufficient if we are to understand why some initiatives fail and others succeed. There are very different imaginations of circular economy in circulation, the fate of which needs further explication and explanation, with regard to the obduracy of some institutions and systems and the gradual re-configuration of others.

Our study also suggests that more research is needed into the more critical aspects of implementing circular economy strategies, in terms of environmental rebound effects, social and geographical injustices. These are emerging issues as more businesses, industries and cities engage with the circular economy. Although much positive can be – and has been – said about circular economy, there is a need to be wary of – and to investigate – the pitfalls.

In order to reflect on the potential for the circular economy in driving urban sustainability transitions and their implications for social and environmental justice in cities, further studies should engage with in-depth empirical enquiries by integrating a constitutive co-productionist approach with in-depth interactionist studies of the social dynamics and institutional changes involved in governing circular urban development. This entails identifying governance challenges with the potential for creating an unjust prioritisation of social groups and for losing touch with local communities. Such predicaments might result in the delegitimisation of circular urban strategies, and the risk of preventing sustainable implementations of circular urban pathways.

A deeper understanding of circular economy imaginaries and their impact on social orders within different urban contexts can open up valuable novel insights about the invisible epistemics and normative contexts in which legitimacy claims on the opportunities and shortcomings of urban circularities are made and evaluated. Further studies should, therefore, focus on the following themes and research questions.

1. It is important to be aware that a core argument in the co-production literature is that sociotechnical imaginaries guide political and social action in technological and institutional areas, but also that co-production processes might silence some actors and/or render invisible some forms of knowledge. In particular, it would be important to:
    a. Map the scholarly communities and knowledge networks specialising in theorising and translating the circular economy into epistemic practices with regard to the sociality characterising them internally and relating them to other groups
    b. Unpack the social ties and self-images developed by the different experts or instrument constituencies involved in the politics of urban circularities
    c. Understand what is being silenced in experts' accountings of the circular economy, why and how.
    d. Identify the roles different actors play in the co-production of situated circular economy imaginaries and develop reflexive accounts of the relationships between actor-network configurations, power structures and forms of knowledge included in the co-production processes.
2. How can we account for the institutionalisation and structuration of situated circular economy imaginaries? In particular:
    a. What roles do both obduracy and re-configurations play?
    b. What roles do the slowing, narrowing and closing of resource flows play in situated circular economy imaginaries? What role does the focus on consumption patterns play in the development of situated circular imaginaries? What are the intended and the actual environmental implications of situated circular economy imaginaries?
    c. How do people and social collectives respond to projections of shared identities among diverse actors emanating from polices on the circular and sharing economy?
3. Developing and implementing circular economy strategies in cities calls for new governance systems and/or changes in the existing governance arrangements, for example, planning systems, municipal operations and consumption patterns. How should we study urban governance to gain better insights into the coproduction of circular economy imaginaries in cities? In particular:
    a. How does circular economy travel across different geographical contexts? Is it transferable and scalable across cities and countries?
    b. What are the intended and unintended implications of circular economy imaginaries for social, geographical and environmental justice in cities?
    c. What spatial politics are produced by the coproduction processes of the circular economy in cities?
    d. How is the desire for an increased circularity of urban flows interrelated with the need to create better places to live and work?
    e. What competing normativities of sustainability, inclusion and justice emerge through engagements in urban circularity and how are they negotiated?
    f. What impacts do circular economy imaginaries have on the directionality of urban transformations?
    g. What scales, processes, practices, artefacts and actors play a role in the co-production of values, normativities and directionality of circular economy in cities? How do they contribute to (re)making and undoing urban systems and networks?

Taken together, these themes and research questions highlight the need to understand circular economy as more than 'a technological fix'; the need to conceptualise circular economy and urban transitions as co-produced in and by the social, spatial, material and institutional contexts in which these ambitions flourish. This also highlights the need for interdisciplinary research that can

synthesise insights from the natural and technical sciences, as well from sociology, geography and political science, in order to expand understandings within and across disciplines, to provide more robust recommendations for sustainability transitions.

6 Acknowledgments

This work was supported by the Danish Industry Foundation and the National Danish Program for EU Regional Fund 2014-2020 "Innovative and sustainable growth in businesses".

We would like to thank the reviewers for their insightful comments on how to improve the paper.

7 References

APUR – Atelier Parisien d'URbanisme, 2017. A fresh look at the economy in Paris – New economic models: circular/ social and inclusive/ collaborative. Available at: https://www.apur.org/fr/nos-travaux/regards-leconomie-paris-nouvelles-formes-leconomie-circulaire-sociale-solidaire (accessed 01-04-2019)

Bocken, N.M.P., de Pauw, I., Bakker, C., van der Grinten, B., 2016. Product design and business model strategies for a circular economy. Journal of Industrial and Production Engineering. 33, 308–320. https://doi.org/10.1080/21681015.2016.1172124

Borup, M., Brown, N., Konrad, K. & Van Lente, H., 2006. The sociology of expectations in science and technology, Technology analysis & strategic management, 18, 285–98.

Boulding, K.E., 1966. The economics of the coming spaceship Earth, in: Jarret H. (Eds.) Environmental Quality in a Growing Economy.: Resources for the Future Library Collection. Johns Hopkins University Press, Baltimore, 3–14. https://doi.org/10.4324/9781315064147

Bulkeley, H., Castan-Broto, V., Hodson, M. & Marvin, S. (Eds.) 2010. Cities and Low Carbon Transitions. Routledge, London.

Carlsberg Group, 2016. Sustainability Report. Carlsberg A/S. Available at: https://carlsberggroup.com/media/10920/2016-sustainability-report.pdf (accessed 07/11/2018)

CIRAIG, 2015. Circular economy: a critical literature review of concepts. Montréal,Québec, Canada. Available at http://www.ciraig.org/pdf/CIRAIG Circular Economy Literature Review Oct 2015.pdf (accessed 30/11/2018).

CIRCLE Economy, FABRIC TNO, Gemeente Amsterdam, 2015. Circular Amsterdam - A vision and action agenda for the city and the metropolitan area. Available at: https://www.circle-economy.com/wp-content/uploads/2016/04/Circular-Amsterdam-EN-small-210316.pdf (accessed 11/11/2018).

City of Amsterdam, 2016. Action plan sharing economy. Available at: https://www.slideshare.net/shareNL/amsterdam-actionplan-sharing-economy (accessed 11/11/2018).

City of Amsterdam, 2015. Sustainable Amsterdam. https://www.amsterdam.nl/bestuur-organisatie/organisatie/ruimte-economie/ruimte-duurzaamheid/making-amsterdam/amsterdam-outlines/ (accessed 11/11/2018).

City of Amsterdam, 2012. Towards the Amsterdam Circular Economy. Available at: https://assets.amsterdam.nl/publish/pages/580742/towards_the_amsterdam_circular_economy_web.pdf. (accessed 30/11/2018).

Cohen, B., Muñoz, P., 2016. Sharing cities and sustainable consumption and production: towards an integrated framework. Journal of Cleaner Production 134, 87–97. https://doi.org/10.1016/j.jclepro.2015.07.133

Cossu, R., Williams, I.D., 2015. Urban mining: concepts , terminology , challenges. Waste Management 45, 1–3. https://doi.org/http://dx.doi.org/10.1016/j.wasman.2015.08.028

Dieleman H. (2013). Organisational learning for resilient cities, through realising eco-cultural innovations. Journal of Cleaner Production 50, 171–180

Ellen MacArthur Foundation, 2012. Towards the circular economy Vol. 1: an economic and business rationale for an accelerated transition. Available at: https://www.ellenmacarthurfoundation.org/publications/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an-accelerated-transition (accessed 22/11/2018)

Ellen MacArthur Foundation, 2013. Towards the circular economy Vol. 2: opportunities for the consumer goods sector. Available at: https://www.ellenmacarthurfoundation.org/publications/towards-the-circular-economy-vol-2-opportunities-for-the-consumer-goods-sector (accessed 22/11/2018)

Ellen MacArthur Foundation, 2014.Towards the Circular Economy Vol. 3: Accelerating the scale-up across global supply chains. Available at: https://www.ellenmacarthurfoundation.org/publications/towards-the-circular-economy-vol-3-accelerating-the-scale-up-across-global-supply-chains (accessed 25/11/2018).

Ellen MacArthur Foundation, 2015. Delivering the Circular Economy a Toolkit for Policymakers. Avaliable at: https://www.ellenmacarthurfoundation.org/publications/delivering-the-circular-economy-a-toolkit-for-policymakers (accessed 22/11/2018)

Ellen MacArthur Foundation, 2017. Cities in the Circular Economy: an initial exploration. Avaliable at: https://www.ellenmacarthurfoundation.org/publications/cities-in-the-circular-economy-an-initial-exploration (accessed 19/11/2018)

Ellen MacArthur Foundation, Sun Post Foundation and McKinsey, 2015. Growth within: a circular economy vision for a competitive Europe, Ellen MacArthur Foundation. Available at: https://www.ellenmacarthurfoundation.org/publications/growth-within-a-circular-economy-vision-for-a-competitive-europe (accessed 19/11/2018)

European Commission, 2015. Communication from the Commission to the European Parliament, the council, the European economic and social committee and the committee of the regions. Closing the loop - An EU action plan for the circular economy. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF (accessed 01-04-2019)

Fairclough, N., 1992. Discourse and Social Change. Polity Press, Cambridge.

Flyvbjerg, B., 2006. Five misunderstandings about case-study research. Qualitative Inquiry 12, 219–245. https://doi.org/10.1177/1077800405284363

Frantzeskaki, N., Broto, V.C., Coenen, L., Loorbach, D., 2017. Urban Sustainability Transitions: The Dynamics and Opportunities of Sustainability Transitions in Cities, in: Frantzeskaki, N.,

Broto, V.C., Coenen, L., Loorbach, D. (Eds.), Urban Sustainability Transitions. Routledge, New York, 1–22. https://doi.org/10.4324/9781315228389

Fratini, C.F., Jensen, J.S., 2017. The role of place-specific dynamics in the destabilisation of the Danish water regime: an actor-network view on urban sustainability transitions, in: Frantzeskaki, N., Broto, V.C., Coenen, L., Loorbach, D. (Eds.), Urban Sustainability Transitions. Routledge, New York, 86–105..

Frosch, R.A., Gallopoulos, N.E. (1989). Strategies for manufacturing. Scientific American, 261 (3), 144–153.

Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Hultink, E.J., 2017. The Circular Economy – A new sustainability paradigm? Journal of Cleaner Production 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Georg, S., 2015. Building sustainable cities: Tools for developing new building practices? Global Networks 15, 325–342. https://doi.org/10.1111/glob.12081

Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production 114, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007

Government of the Netherlands, 2016. The Green Deal, Green Growth Animation. Available at: https://www.greendeals.nl/english (accessed 30/11/2018)

Graedel, T. E., Allenby, B.R., 1996. Design for Environment. Prentice Hall, Upper Saddle River.

Gregson, N., Crang, M., Fuller, S., Holmes, H., 2015. Interrogating the circular economy: the moral economy of resource recovery in the EU. Economy and Society 44, 218–243. https://doi.org/10.1080/03085147.2015.1013353

Grin, J., Frantzeskaki, N., Broto, V.C., Coenen, L., 2017. Sustainability Transitions and the City: Linking to Transition Studies and Looking Forward, in: Frantzeskaki, N., Broto, V.C., Coenen, L., Loorbach, D. (Eds.), Urban Sustainability Transitions. Routledge, New York, 359–368.

Gutberlet, J., 2015. Cooperative urban mining in Brazil: Collective practices in selective household waste collection and recycling. Waste Management 45, 22–31. https://doi.org/10.1016/j.wasman.2015.06.023

Hobson. K., 2016. Closing the loop or squaring the circle? Locating generative spaces for the circular economy. Progress in Human Geography 40(1), 88–104

Hobson, K., Lynch, N., 2016. Diversifying and de-growing the circular economy: radical social transformation in a resource-scarce world. Futures 82, 15–25. https://doi.org/10.1016/j.futures.2016.05.012

Hodson, M. & Marvin, S. (2010) Can cities shape sociotechnical transitions and how would we know if they were? Research Policy, 39(4), pp. 477–485.

Jasanoff, S., 2004. States of Knowledge - The Coproduction of Science and Social Order. Routledge, New York. https://doi.org/10.4324/9780203413845

Jasanoff, S., Kim, S.-H., 2015. Dreamscapes of Modernity. University of Chicago Press, Chicago and London. https://doi.org/10.7208/chicago/9780226276663.001.0001

Jensen, J.S., Lauridsen, E.H., Fratini, C.F., Hoffmann, B., 2015. Harbour bathing and the urban transition of water in Copenhagen: Junctions, mediators, and urban navigations. Environ. Plan. A 47, 554-570. https://doi.org/10.1068/a130132p

Korhonen, J., Honkasalo, A., Seppälä, J. 2018. Circular economy: the concept and its limitations. Ecological Economics 143, 37–46.

Lacy, P., Rutqvist, J., 2014. Waste to Wealth, The Circular Economy Advantage. Palgrave Macmillan UK, London.

Latour, B., 1993. We Have Never been Modern. Harvester Wheatsheaf, New York.

Latour, B., 2004. Why has critique run out of steam? From matters of fact to matters of concern. Critical Inquiry 30, 225–248. https://doi.org/10.1086/421123

Leach, M., Scoones, I., Stirling, A., 2010. Governing epidemics in an age of complexity: narratives, politics and pathways to sustainability. Global Environmental Change 20, 369–377. https://doi.org/10.1016/j.gloenvcha.2009.11.008

Lieder, M., Rashid, A., 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. Journal of Cleaner Production 115, 36–51. https://doi.org/10.1016/j.jclepro.2015.12.042

London Waste and Recycling Board, 2017. London's circular economy route map. Available at: https://www.lwarb.gov.uk/wp-content/uploads/2015/04/LWARB-London's-CE-route-map_16.6.17a_singlepages_sml.pdf (accessed 12/11/2018)

London Waste and Recycling Board, 2015. London: The Circular Economy Capital. Towards a circular economy - context and opportunities. Available at: https://www.lwarb.gov.uk/wp-content/uploads/2015/12/LWARB-circular-economy-report_web_08.12.15b.pdf (accessed 12/11/2018).

Mairie de Paris, Agence de l'Environnement et de la Maitrise de l'Energie, 2016. White Paper on the Circular Economy of Greater Paris. Available at: https://api-site.paris.fr/images/77050 (accessed 15/11/2018).

Marin, J., De Meulder, B., 2018. Interpreting circularity. Circular city representations concealing transition drivers. Sustainability 10 (5). https://doi.org/10.3390/su10051310

McDonough, W., Braungart, M., 2002. Cradle to Cradle: Remaking the Way We Make Things, 2nd ed. North Point, New York.

McKinsey Center for Business and Environment, 2016. The circular economy: Moving from theory to practice. Mckensey & Company. Available at: https://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/the-circular-economy-moving-from-theory-to-practice (accessed 07/11/2018).

Meerow, S., Newell, J.P., Stults, M., 2016. Defining urban resilience: A review. Landscape and Urban Planning 147, 38–49. https://doi.org/10.1016/j.landurbplan.2015.11.011

Moreau,V., Sahakian, M., van Griethuysen, P. and ois Vuille F. (2017). Coming full circle: why social and institutional dimensions matter for the circular economy. Journal of Industrial Ecology 21 (3), 497-506.

Pearce, D.W., Turner, R.K., 1990. Economics of Natural Resources and the Environment. JHU Press, Chicago.

Pfister, T., 2016. Co-producing European integration: research, policy and welfare activation, in: Voss, J.-P., Freeman, R. (Eds.), Knowing Governance: The Epistemic Construction of Political Order. Palgrave Macmillan, London, 63–85.

Prendeville, S., Cherim, E., Bocken, N., 2018. Circular cities: mapping six cities in transition. Environmental Innovation and Societal Transitions 26, 171–194. https://doi.org/10.1016/j.eist.2017.03.002

Samuel, H., 2015. France passes "pioneering" food waste bill to ban supermarkets from binning unused food.The Telegraph. Available at: https://www.waste360.com/food-waste/france-passes-pioneering-food-waste-bill-ban-supermarkets-binning-unused-food (accessed 01-04-2019).

Scott, W.R., 1995. Institutions and Organisations. SAGE Publications, Thousand Oaks.

Stirling, A., 2016. Knowing Doing Governing: Realising Heterodyne Democracies. Chapter 12 in: Voß, J.-P., Freeman, R. (Eds.), Knowing Governance: The Epistemic Construction of Political Order. Palgrave Macmillan UK, London, 259-286. https://doi.org/10.1057/9781137514509

Stahel, W.R., 2010. The Performance Economy, second ed. Palgrave Macmillan, Basingstoke, New York.

Tukker, A., 2015. Product services for a resource-efficient and circular economy - A review. Journal of Cleaner Production 97, 76–91.

Uyarra, E., Gee, S., 2013. Transforming urban waste into sustainable material and energy usage: the case of Greater Manchester (UK). Journal of Cleaner Production 50, 101–110. https://doi.org/10.1016/j.jclepro.2012.11.046

Valenzuela, F., Böhm, S., 2017. Against wasted politics: a critique of the circular economy. Ephemera theory and politics in Organization 17, 23–60.

Vergragt, P.J., Dendler, L., de Jong, M., Matus, K., 2016. Transitions to sustainable consumption and production in cities. J. Clean. Prod. 134, 1–12. https://doi.org/10.1016/j.jclepro.2016.05.050

Voss, J.-P., Freeman, R., 2016. Introduction: Knowing Governance, in: Voß, J.-P., Freeman, R. (Eds.), Knowing Governance: The Epistemic Construction of Political Order. Palgrave Macmillan UK, London, pp. 1–35. https://doi.org/10.1057/9781137514509

World Bank Group (2017). China Circular Economy Promotion Law. Available at: https://ppp.worldbank.org/public-private-partnership/library/china-circular-economy-promotion-law (accessed 19-11-2018)

World Business Council for Sustainable Development, 2017. 8 Business Cases for the Circular Economy. Available at: https://www.wbcsd.org/Programs/Circular-Economy/Factor-10/Resources/8-Business-Cases-to-the-Circular-Economy (accessed 07/11/2018)

World Economic Forum, 2014. Towards the Circular Economy: Accelerating the scale up across global supply chain. World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_ENV_TowardsCircularEconomy_Report_2014.pdf (accessed 07/11/2018).

Zink, T., Geyer, R., 2017. Circular economy rebound. Journal of Industrial Ecology 21, 593–602. https://doi.org/10.1111/jiec.12545