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Understanding the societal, entrepreneurship and economic aspects of developing a circular economy in cities: a case study of coventry in the UK

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Abstract
One of the points of agreement emerging from international environmental policy debates is that people's choices, behaviors and lifestyles will play a vital role in achieving sustainable development (Biwei, 2012; Fleischmann, 2016). There is strong evidence of the importance of a working Circular Economy (CE) to address sustainability challenges but there are different accounts and narratives in the CE literature which can cause confusion when trying to define and understand the concept. Urbanisation coupled with the fact that cities are resource inefficient (Agudela-Vera 2012) has given rise to the emergence of Circular Cities such as, Amsterdam but research to date has had a strong emphasis on the "supply side" (business, policy, science) with little attention being paid to the people or "demand side" (social, consumer). It would therefore be helpful to develop a better understanding of the role that citizens and not just City governments can play in a Circular City. To address this the paper uses an illustrative example of Coventry in the UK to examine the strategies and policy actions that drive CE relevant grass roots citizen driven practices and innovations. Through the lens of this example the paper provides insights into the role that citizens could play in developing Circular Cities through citizen driven innovation mechanisms such as social enterprise. The paper concludes that we are lacking sufficient socio-economic evidence of impact on the "demand side" and provides recommendations for further research into the social and citizen driven innovation aspects of CE relevant activities in cities.

Introduction

One of the relatively few points of agreement to have emerged from recent international environmental policy debates is that people's choices, behaviours and lifestyles will play a vital role in achieving sustainable development (Biwei, 2012; Fleischmann et al, 2016). For complex societal challenges, the line between the socio-political, technological and economic context is increasingly blurred (Fitzgerald, 2016). Circular Economy (CE) is focused on supporting sustainable development by addressing flaws in the current linear "take-make-dispose" economy. As an emerging field, the emphasis to date has been on the "supply side" (business, scientific, political). As citizens are an important consideration for achieving sustainable development, we need to balance this with a better understanding of the "demand side" (people society).

With 75% of global natural resources consumed in cities (UNEP-DTIE, 2012), policy and funding support for CE as a solution for urban settings is growing. A recent report (McKinsey 2015) estimated the CE market to be €1.8 trillion by 2030. These factors countered with socio-political and financial pressures on cities to reduce waste, pollution and related environmental concerns means that cities are starting to pay close attention to circular.

Current research and practice on circular in cities focuses on the benefits to be gained from CE frameworks, with little consensus on implementation at city level (Prendeville 2017). Most research examines the roles of government and business, with very few studies engaging citizens beyond this. A deeper understanding is needed of society's potential role within CE to demystify circular for audiences beyond academia, business and government (Hobson & Lynch 2016). This paper reviews what is known about citizens in CE and uses a case example to illustrate the value of focusing on the "demand side" of the problem.

What we know about CE

The Circular economy matters

The Ellen MacArthur Foundation (EMF) acknowledges the roots of CE as dating back to the 1970's, with seven approaches associated with this evolution. To better understand the societal aspects of CE and to pinpoint

potential future lines of inquiry a synopsis of each is provided here.

Cradle to Cradle (C2C), Stahel (1976), explores how to achieve radical industrial transformation by switching from a linear cradle to grave pattern to cradle to cradle design (Braungart and McDonough 2002, 2008). C2C favours designing products that have upcycling in mind from the outset. It has gained traction with the emergence of certified C2C products. Regardless of C2C's criticism (Llorach-Massana 2015), it could offer citizens the option to support CE through choosing C2C products in their own building projects.

Stahel's (2006) *Performance Economy*, focuses on labour and small loop manufacturing for regional job creation and reducing CO2 production, but does not elaborate on how the ambitious paradigm shift could be achieved in practice.

The main authors on *Industrial Ecology*, Frosch and Gallopoulos (1989), promote consideration of the local ecosystem when designing closed loop industrial processes. The interdisciplinary routes of this field support engagement with social wellbeing, the local and regional economy. The relevance to circular in cities could be improved upon by extending the focus beyond the role of private to social enterprise and would be timely for the shrinking state, creating demand for non-state actors to address challenges, as experienced by the case study to follow.

Biomimicry looks to nature for environmentally friendly solutions to design challenges, for inspiration and innovation. Benyus (1997) promotes additive manufacturing, a key component of this papers fab lab case study, as a mechanism for realising a biomimicry approach to circular by for example, reducing the need for a supply chain by 3D printing parts in local car garages.

Natural Capitalism (NC) concentrates on the businesses that put the planet at risk by underestimating the true value of natural resources (Lovins and Lovins, 1999). NC identifies the importance of place and location, with one example being local sourcing of food.

Fullerton (2015) presents empowered participation and the role of community and place amongst eight systemic principles of the *regenerative economy*.

Pauli (2009) argues that the green economy lacks significant momentum because it only works for the rich. He proposes a *Blue Economy*, with more focus on the local environment and on valuing resources.

As these competing narratives describe CE from different theoretical perspectives and standpoints, they can be difficult to reconcile. However, it is notable that they give relatively little attention to the social aspects of CE. While some of the authors engage to a limited degree with the role of citizens in CE, others do so to a much lesser extent. Although the social context for CE is messy and complex, greater attention needs to be given to understanding the demand side's role in developing circular cities.

The societal "demand side" of CE

Despite a call for more citizen engagement in CE (Hobson, 2016; Prendeville et al, 2017), very few empirical studies have examined where and why citizens engage in CE. Of the larger studies that do exist, many come from China, so their relevance could be questioned. Notwithstanding these concerns, these studies highlight the need to focus on the role of the citizen (Biwei, 2012; Hobson 2016). This focus aligns with other calls for a wider systems perspective of the problem (Webster, 2013) and for greater attention to the social aspects (Hobson and Lynch 2016), to establish a more inclusive CE culture. Existing examples of CE citizen engagement, such as in citizen innovation spaces; living labs and Digital Fabrication Labs, offer a rich source of insight into the issue.

Following The Helsinki Manifesto (November 2006, Finnish EU Presidency), which supported citizen centred innovation through Living labs (user-centred, open innovation ecosystems based on a systematic user co-creation approach), citizen-driven innovation quickly developed. Strategic policy initiatives and funding streams, emphasising the human and social aspects needed to speed up innovation followed. The role of citizens as the driving force for urban innovation came to the fore (Eskelinen et al 2015), as Steiner et al. (2015: 160-161) explain: *"Combinations of both top-down interventions and citizen-driven innovations will likely lead to more sustainable crises resolution than either approach alone"*

Citizen-driven innovation is most prominent in cities and mostly responds to societal challenges. This is evidenced in the analysis of citizen "prosumption", which reflects the interrelated process of production and consumption (Ritzer, 2014). Such as in citizen engagement with renewable energy and smart grids (Rathnayaka, 2014), where citizens are encouraged to produce energy to reduce their tariffs whilst also supporting their local environment. Increasing knowledge on how to engage more citizens in this type of "prosumption" at scale, could allow ambitions for circular cities to be more easily realised. Taking an in-depth view of specific examples of citizen engagement in circular economy already in operation, is likely to offer useful insights for engaging citizens more widely in CE (http://sustainablefoodcities.org/about).

Over the past decade cities have strived to become more sustainable through implementing policy and investing in smart cities, sustainable cities, eco cities and others. While these approaches represent better governance and tighter legislation, their success has been limited due to a lack of attention to socio-political mechanisms (Prendeville, 2017). Da Jong (2015), for example, excludes circular cities from his study, citing a need for more nuanced and

rigorous research to increase confidence that a circular city approach can benefit urban sustainability. Uncertainty about the fit between the "supply" and "demand" sides of CE are at the heart of the problem. Although systemic views of CE acknowledge the role of consumers, these approaches typically take a top-down view that do not fully engage with the social side of circular. More therefore needs to be known about the contributions that citizens can make to circular through different types of grass-roots activity, or of how those contributions fit within the CE approach. The Fab Lab Coventry case, a digital fabrication laboratory that the lead author helped to establish and support, reveals the potential of citizen innovation for CE.

Coventry City and Fab Lab Coventry

An exploratory case study approach was used (Yin, 2009) to provide a review of several community activities, including Fab Lab Coventry. The case builds on a literature review of the recent emergence of circular transition cities. After reviewing the role of citizens within this context, a desk-based investigation was undertaken that explored the underlying socio-economic drivers in the city. The investigation examined the most relevant local strategies and reviewed existing engagement policies and practices. The aim was to understand the factors likely to support the development of CE through community-led grass roots innovation. The researcher also attended community events/workshops, to observe the development of these initiatives, keeping a journal of observations to draw out common themes and recommendations for further investigation and analysis.

Context of Austerity

A main contextual factor emerging from this data gathering, was the severe austerity measures being implemented in the city. As a response to the global financial crisis of 2007, the former UK Conservative led coalition government ushered in a new 'age of austerity' (Cameron 2009). By 2020, Coventry will have suffered a 55 per cent reduction in its grant from government since 2010, equivalent to £120 million a year (Coventry city council 2016). By 2020, the council will only be able to deliver statuary services (Gilbert 2016), leading to the closure and consolidation of libraries and centralisation of services (Hastings et al 2015). This depressing economic climate was the context for establishing a growing number of grass roots community initiatives, such as Fab Lab Coventry.

Coventry Programmes, practices and policies of relevance to citizen driven innovation

Reviewing the City's post austerity measures (see Cultural strategy 2017-2027, Digital Strategy 2017, Local strategic economic plan and Climate Change Strategy to 2020) reveals an ongoing ambition for the city's socio economic growth. Each of the strategies consulted advocates a strong role for citizens in achieving the economic vision, and puts structures, processes and funding in place to support citizen driven innovation. For example, the climate strategy advocates the transfer of green space to local community growing schemes and the cultural strategy celebrates the transfer of city assets, such as tourist attractions, to citizens/community groups. Political leadership for these schemes is provided through Councillor Faye Abbott.

Common, practices, policies and infrastructure in the city that are of relevance to CE include 'proof of concept' funding to support the setup of new social enterprises with an environmental purpose. Examples include volunteers from Coventry Foodbank setting up a community shop to take food waste from local supermarkets and retail it for 10% of the original price to those experiencing food poverty; and a local enterprise looking to fund the upcycle and sale of clothes from local clothes banks. To grow this type of citizen activism, the City Council and Coventry University have worked with the UK Government to establish the city as a nationally accredited Social Enterprise place. Fab Lab Coventry (FLC) was set up with support from this initiative.

FLC is a socially driven digital fabrication laboratory in the heart of the city centre. It was set up in partnership with Coventry University, the University of Warwick and the City Council.

Two thousand local people and organisations co-created the FLC space and operations. FLC opened in an un-rentable shop in the city centre and attracted skilled volunteers, who built the space and made furniture from waste materials. The space opened in August 2016, and by June 2017 was attracting an average of 100 people per week, working on their own projects; learning about new technologies, woodworking, robotics or attending the repair cafes. The FLC repair cafés "(Figure1.)", are attended by people aged 5-70 and have attracted local

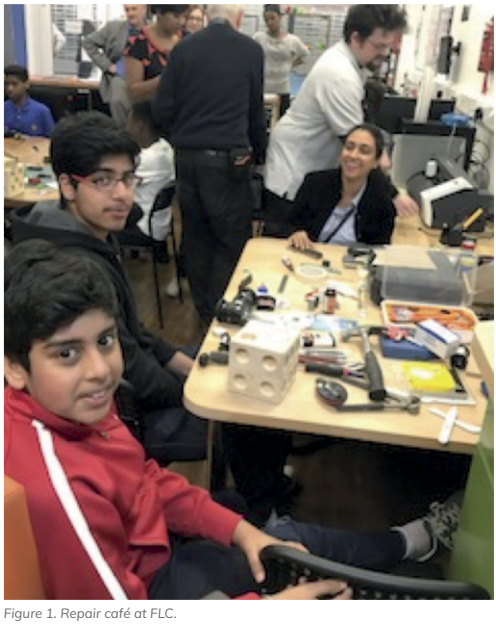

Figure 1. Repair café at FLC.

media attention, including being featured on the regional BBC news programme, *Midlands Today.*

While parents and the older population are the most enthusiastic about the repair café, younger participants also enjoy them. They may not be 100% convinced that they should repair toys instead of getting new ones, but they do acknowledge their pleasure at being able to fix their favourite fidget spinners, Lego or toy cars. As one enthusiastic 9-year old attendee explained: *"it's my favourite toy and I can go the fab lab to get it fixed cus they don't sell them in the shop".*

FLC also runs fun social activities to engage citizens in CE. A recent cardboard car race run in collaboration with local arts organisations, promoted a fun way to use recycled cardboard "(Figure.2)". This initiative was a mechanism for encouraging upcycling and use of a local social enterprise called crowrecycling.co.uk.

The role of everyday activism and grass roots innovation in spaces like the community based fab labs offers clear potential to support the development of a circular economy in cities.

Conclusions

This paper has revealed a number of aspects that merit further consideration in building understanding of the development of CE in cities. Firstly, despite widespread agreement that CE matters, it can be difficult to reconcile different narratives about how it is constituted. Secondly, there has been a heavy emphasis on the "supply side" aspects of business, policy, technology and science, with less attention to the "demand side" societal aspects. Thirdly, the illustrative example of Coventry shows an opportunity to involve social entrepreneurs and what we might term CE practitioners. For example, while questions might arise about whether it "fits" CE, FLC represents the type of space that can support circular. This raises questions about how the CE lens could be widened from a "supply side" focus to more proactively encourage the efforts of the grass roots "demand side". The need to engage people in sustainable development is one of few points of agreement within international environmental policy debates (Fleischmann 2016), so this should certainly be factored into a city's transition to CE.

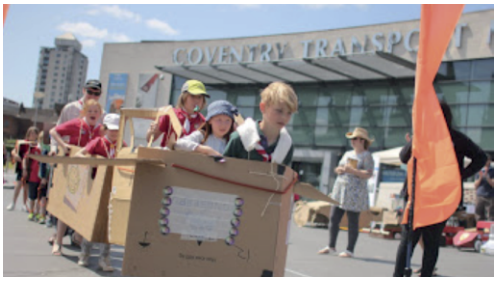

Figure 2. Wear your wheels.

Fourthly, the role of citizens has had little attention within CE. To address this, we need to know more about the role of people, the differing social contexts, and the types of initiatives and roles that citizens play in everyday activism and in driving innovations that might be considered part of a CE framework. Citizen-driven innovation in the context of austerity has grown in Coventry out of necessity, but this may not translate to other countries that have a stronger welfare provision.

This cross-national dimension also merits further investigation. Social enterprises and participatory spaces such as FLC might be part of what is needed to achieve CE in cities. However, a better understanding is needed to unpick their potential role. Further empirical studies should be commissioned to explore the role of place within CE, building on work in other contexts (e.g. O'Connor 2010).

Finally, reflecting on the potential role of citizens within CE and on mechanisms to achieve wider societal engagement such as smart grids, cities digital fabrication labs and repair cafes, whether citizens want to play a role in CE should be considered. The extent to which citizens need to know more about CE is linked to this question.

What is clear from the literature and illustrative study in Coventry is that to support cities on their journey towards the next phase of CE, more research is needed to consider the "demand side" and to improve our understanding of socio-political factors, citizen empowered participation and activism.

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