

Local Governments Strategizing for the Circular Economy

Benoit Ruyschaert^{1,2}, Tom Kuppens^{2,3,4}; and Nathalie Crutzen¹

¹Université de Liège, HEC Liège, 4000, Belgium

²Hasselt University, Centre for Environmental Sciences, 3590, Belgium

³Hasselt University, School of Educational Studies, 3590, Belgium

⁴Vrije Universiteit Brussel, Multidisciplinair Instituut Lerarenopleiding, 1050, Belgium

Abstract

Now that many national governments have adopted ambitions for the circular economy (CE) as means towards sustainable development, local governments are assigned a fundamental role in the implementation into the local ecosystem. However, only explorative research has studied the adoption of the CE at the local level. Therefore, a survey was developed to study the adoption among all 581 Belgian local governments. In total, 309 local governments responded (54%), of which 182 (59%) said to have adopted the CE. Based on the context, content, and process of the CE adoption, two groups were identified, showing different levels of weak versus strong sustainability. These insights support the further adoption of the CE and provide a starting point for future research. Moreover, the survey can be used for future research on other countries or organization and their progress toward the CE.

Keywords: Circular Economy, Local Governments, Sustainability, Survey

Introduction

The CE is an alternative to the linear economy that focuses on reducing, reusing, recycling, and recovering materials to reduce waste production and the consumption of virgin materials and energy to achieve sustainable development (Kirchherr et al., 2017). To become the first climate-neutral continent, the European Union has made the CE a priority (European Commission, 2019). This implies that the CE needs to be implemented by its member states and, ultimately, the many local governments responsible for the municipalities. Local governments play a key role in this transition, providing many opportunities for the CE (European Commission, 2021). The CE can be initiated locally with pilot projects, experimentation zones, and policies that fit the local context (Fratini et al., 2019; Levoso et al., 2020). This can be done in collaboration with local stakeholders to allow system changes required by the CE (Levoso et al., 2020; Paiho et al., 2020). Local governments are the governments closest to citizens, allowing citizens' involvement in policy-making for the CE. As public sector organizations, local governments can set a good example by using circular procurement for public spending (Levoso et al., 2020). Moreover, local governments are often responsible for key domains such as waste management and the local economy.

Nevertheless, research on this topic is scarce. The public sector, in general, has been researched in Portugal to study how the CE is adopted and identified the internal context as a key determinant (Klein et al., 2021a, 2022). For local governments, research has tried to conceptualize core aspects of the CE and developed a framework for implementation by relying on existing literature and case studies (Levoso et al., 2020; Paiho et al., 2020). Different CE strategies adopted by local governments have also been studied through comparative case studies, identifying different strategies (Bolger & Doyon, 2019; Prendeville et al., 2018). A study on different potential CE strategies for the Brussels-Capital Region showed the great potential to reduce its material and

carbon footprint. The formulation process of the CE strategy of this region has also been studied (Kębłowski et al., 2020).

Although the literature stresses the importance of local governments for the CE, existing knowledge is only based on exploratory research looking at previous literature and some case studies. The need for research on a large number of observations is raised to better understand the adoption of the CE by local governments (Klein et al., 2020; Levoso et al., 2020; Prendeville et al., 2018).

Therefore, this study answers two research questions. First, to what extent do local governments consider the CE? Secondly, if the CE is considered, what is the context, content, and process of the adoption in these local governments?

To answer these questions, a survey was developed based on previous literature and structured according to Pettigrew's framework, distinguishing three factors of organizational change: the context, the content, and the process (Pettigrew, 1985). This survey was sent to all 581 Belgian local governments and obtained a response rate of 54%. In total, 59% of the local governments had adopted the CE, implying that many are still not doing so. A cluster analysis identified two groups. Both groups were similar regarding the most important barriers, CE aspects, value chains, and policy instruments considered. However, significant differences were found for the important drivers and stakeholders to adopt the CE, reflecting different levels of supporting strong sustainability. These findings provide insights into the adoption of the CE by local governments, needed by both researchers and practitioners to support further implementation. Moreover, the survey can be used to study the adoption of the CE in other areas or organizations and to assess progress.

The remainder of this article is structured as follows. First, the literature on the CE and local governments is discussed. Next, the methodology explains how the survey was developed and implemented. In the results, findings are presented and the clusters are interpreted. In the discussion, findings are related to previous research, implications for theory and practice are discussed, as well as the limitations and directions for future research. Finally, the conclusion provides a synthesis of the study.

Literature

The circular economy

The ‘Circular Economy’ (CE) gained interest in the last decade thanks to the Ellen MacArthur Foundation (Ellen MacArthur Foundation, 2015). However, this concept is not new and is based on principles like cradle-to-cradle, which have been studied for many years (Braungart & McDonough, 2002). Due to the increased attention to this concept, many definitions have been adopted, and a general definition was missing (Kirchherr et al., 2017). In 2017, Kirchherr et al. reviewed 144 definitions and developed a more holistic one, defining CE as “an economic system that replaces the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks), and macro level (city, region, nation, and beyond), with the aim to accomplish sustainable development, this simultaneously creating environmental quality, economic prosperity, and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers.” (Kirchherr et al., 2017, p. 299). Although some criticize this definition, it is widely adopted (Figge et al., 2023). This definition shows that the ultimate goal is to achieve sustainable development.

The CE requires a system change in our consumption and production patterns. A successful transition requires more than just waste management and recycling. According to the review of Kirchherr et al. (2017), the concept is most associated with a combination of reducing, reusing, and recycling activities. These activities are also called R-strategies, and different variations exist (e.g. Bocken et al., 2016; Potting et al., 2017). The R-strategies imply a hierarchy between different loops, depending on their sustainability (Sauvé et al., 2016). The CE promotes “high-value

material cycles instead of recycling only for low-value raw materials as in traditional recycling” (Ghisellini et al., 2016). However, in practice, the focus is often on waste management instead of resource-saving practices (Mura et al., 2020; Vanhuyse et al., 2021). Like for sustainability, a distinction can be made between weak and strong circularity, depending on the change required (Johansson & Henriksson, 2020). The first is more business-as-usual, using the CE to complement existing material extraction so that the economy can keep growing. For strong circularity, a transformation of the economic system is needed and both environmental and social improvement is at the core. According to the European Circular Economy Action Plan, the seven product value chains that consume the most resources and thus have the greatest potential for the CE are: 1) electronics and ICT, 2) batteries and vehicles, 3) packaging, 4) plastics, 5) textiles, 6) construction and buildings, and 7) food, water, and nutrients (European Commission, 2020). Although, implementing the CE proves to be very challenging (Eikelenboom & de Jong, 2022; Ormazabal et al., 2018).

Local governments

To implement the CE, local governments are key as both challenges and opportunities come together at the local level (European Commission, 2021). This study defines local governments as the organizations governing the municipality. These organizations are part of the public sector and traditionally consists of a political body and the administration (Van Hengel et al., 2014). The political body contains the mayor, alderpersons, and the municipal council. They are responsible for policy-making and are elected by citizens. A general director leads the administration responsible for delivering services to the local stakeholders and implementing policies defined by the politicians. In the nineties and the beginning of this century, bureaucratic public sector organizations were reformed under the label of ‘New Public Management’ into more business-like

organizations, adopting strategic management and considering citizens as customers (Hood, 1991). This initially resulted in improving internal efficiency of the public sector but undermined long-term performance (Alford & Greve, 2017). This is because the public sector differs in many ways from companies as they do not operate in a competitive market, for example. As a response, public value became a popular alternative, viewing the pursuit of public value as the main role of the public sector. More recently, public value governance emerged, stressing the importance of the involvement of stakeholders (Alford & Greve, 2017). This is especially important when local governments have to deal with wicked problems like sustainability and the CE.

The circular economy in local governments

Although the sustainability transition is not new to local governments and neither to research, the CE provides an answer to the question ‘how’ sustainability can be pursued. Therefore, the CE needs to contribute to the environmental, economic, and social dimensions of the triple bottom line (Elkington, 1997). For the environmental dimension, Christis et al. (2019) found great potential for the CE to reduce Brussels’s material and carbon footprint, mainly for the food and housing industry. Another driver for local governments to adopt the CE could be city branding. Although, it should be avoided that the CE is only used for greenwashing and should result in real change (Fratini et al., 2019). Moreover, local governments in Europe for example are confronted with CE ambitions at higher levels of government creating top-down pressure to adopt the CE. Pressure can also come from citizens and local stakeholders and create support for a bottom-up adoption of the CE (Prendeville et al., 2018). However, local governments encounter many barriers to adopt the CE (Montenegro Navarro & Jonker, 2018; Paiho et al., 2020). The lack of funding for initiatives was found a key barrier for six European cities of different sizes (Prendeville et al., 2018). A study on the strategy of Melbourne and Malmö showed the lack of knowledge to be a

major barrier. In general, these barriers can be grouped as a lack of: 1) funding, 2) knowledge and awareness, 3) appropriate regulation, taxation, and policies, and 4) political support (Montenegro Navarro & Jonker, 2018; OECD, 2020). A set of barriers for all types of local stakeholders is provided by Paiho et al. (2020). The external environment of local governments is also an important determinant for adopting the CE. For Melbourne and Malmö, both strategies differed because of the different urban situations (Bolger & Doyon, 2019). Prendeville et al. (2018) also observed different approaches among six European cities in terms of aspects of the CE considered, integration plans, objectives, enablers, and barriers. Translating the CE to the local context is the strength of local governments in this transition. Therefore, what aspects of the CE local governments focus on can differ. Paiho et al. (2020) conceptualized seven core elements of the CE for the local level: 1) conservation, 2) reuse and closing material cycles, 3) sharing resources, 4) servitization and virtualization, 5) efficiency, 6) renewable resources, and 7) local production. To implement the CE, local governments will need to involve local stakeholders and work together (Levoso et al., 2020). At the local level, four stakeholder groups, forming the quadruple helix, can be distinguished: businesses, knowledge institutions, governments, and civil society (Carayannis & Campbell, 2009). However, involving stakeholders can be challenging for local governments (Coskun et al., 2022). Several studies provide lists of policy instruments local governments can use for the CE. Montenegro Navarro and Jonker (2018) propose several strategies to overcome the different barriers. Similar instruments were observed in the case studies by Prendeville et al. (Prendeville et al., 2018). The OECD synthesis report (2020) classifies twelve different policy instruments into general roles of promoting, facilitating, or enabling. Paiho et al. (2020) propose fourteen roles for local governments, while the European Investment Bank (2018) describes 15 chronological steps toward the CE at the local level. Ultimately, all these instruments could be

classified as: 1) providing funding, 2) informing and raising awareness, 3) changing legislation and taxation, 4) providing strategic positioning, 5) leading by example, 6) stimulating innovation, 7) stimulating bottom-up initiatives, and 8) connecting stakeholders.

Despite the importance of this topic, only limited knowledge is available based on literature reviews and some case studies. The median number of cases studied is only one in the local CE literature (Vanhuysse et al., 2021). The study by Petit-Boix and Leipold (2018) is an exception, reviewing 300 initiatives from 83 local governments, but only provides insights in the content of these initiatives. More research is needed on a larger set of observations to better understand the adoption of the CE at the local level, taking into account the local context (Klein et al., 2020; Montenegro Navarro & Jonker, 2018; Prendeville et al., 2018).

Methodology

A quantitative survey was used to study whether or not local governments are adopting the CE and the related context, content, and process.

Target population

The survey was used to determine the adoption of the CE by the local governments of all 581 Belgian municipalities. These municipalities are split over three regions: Brussels, Flanders, and Wallonia. Brussels is the capital region and contains 19 municipalities. Flanders is more urbanized than Wallonia and contains 300 municipalities, while Wallonia has 262. Belgium provides an interesting research setting as the CE is adopted across the different levels of governance. Belgium is part of the European Union, committed to the CE through its Circular Economy Action Plan (European Commission, 2020). In addition, the Belgian federal government, and the three regional governments, also adopted CE plans (Belgian Federal Government, 2021;

Brussels-Capital Region, 2016; Flemish Regional Government, 2018; Wallonia Public Service, 2021). Seven Belgian local governments, Bruges, Ghent, Leuven, Liège, Mechelen, Roeselare, and Temse, signed the Circular Cities Declaration (ICLEI Europe, 2023). Therefore, this study allowed to determine if these commitments resulted in widely adopting the CE locally. For each local government, the survey was sent by email to the mayor, the general director, and the alderperson responsible for sustainability. These contact details are publicly available on the local governments' webpage. The email asked to have the survey completed by the person of the local government best aware of the CE or sustainable policy.

Survey design & implementation

The novelty of this topic required the development of a new survey to deductively study the importance of findings from previous exploratory research. The survey was structured according to the framework of Pettigrew (1985), distinguishing between the context, content, and process of organizational change. The context includes both the internal context of the organization and the external environment it operates in. The content describes what the change is about, while the process is about how the change takes place. These three factors are linked and together allow to understand organizational change. The survey started with an introductory question on the municipality's name, the respondent's function, and whether the local government considered the CE. If the CE was adopted, the survey continued with two questions for each factor of the framework. These questions asked to indicate the level of importance of different survey elements for the local government's CE policy. The full list of survey questions can be found in the appendix (see Appendix 1), and the different elements are presented in Table 1. A 5-point Likert scale was adopted to measure importance, ranging from 1 = "Not at all important" to 5 = "Extremely important", similar to previous research (e.g., Klein et al., 2022; Longoni & Cagliano, 2015).

For the context of the adoption, only questions regarding the internal context of the local government itself were asked. For the external context, secondary data were used regarding the size of the municipality and the population. These data were used to see whether these aspects of the external context explained differences in the CE adoption of the local governments. The internal context was first questioned regarding barriers to adopting the CE identified by previous research (Montenegro Navarro & Jonker, 2018). Furthermore, the motivation for adopting the CE was questioned based on pressures, reputation, and triple-bottom-line motivations (Elkington, 1997; Fratini et al., 2019; Prendeville et al., 2018). For the environmental aspect of the triple-bottom line, a distinction was made between tackling climate change, material scarcity, and other environmental problems because previous research has observed different environmental motivations for the CE (Prendeville et al., 2018).

Next, two questions were used to survey the content of the adoption, starting with a question regarding the aspects of the CE that are considered based on the key aspects distinguished by Paiho et al. (2020). Secondly, the importance of the six most important product value chains, according to the New Circular Economy Action Plan, was questioned (European Commission, 2020).

To understand the process of adopting the CE, a question was asked regarding the involvement of stakeholder groups based on the quadruple helix to cover the different groups of local stakeholders (Carayannis & Campbell, 2009). Moreover, the different instruments local governments can use for the CE, according to Montenegro Navarro and Jonker (2018), were questioned.

The initial survey was developed in English before translating it into the three national languages of Belgium, i.e., Dutch, French, and German. Each translation was checked by at least

three researchers that are native speakers. To check comprehensibility, the survey was first tested among peers. In a second test phase, three persons from Belgian local governments were asked to fill out the survey in the presence of the researcher using the think-aloud methodology (Koro et al., 2012). These tests allowed to improve the wording and framing of the survey. To reduce the probability of common-method bias, the anonymity of responses was guaranteed at the start, and clear questions, following a similar structure, were adopted (Podsakoff et al., 2003).

The survey was developed in Qualtrics and was emailed to the contact persons in October 2022. The email also encouraged local governments that did not adopt the CE yet to participate by stating that it would only take three minutes. After two weeks, a reminder was sent to local governments that did not participate yet, and a second reminder was sent after three more weeks. After one more month, no new responses were coming in, so the survey was closed.

Analysis

The survey results were analyzed in R. First, the data were cleaned, deleting responses with many missing data. When multiple responses from the same local government were received, the selection was based on three criteria. The first was preferring a positive response for having the CE in its policy over a negative because it suggested more knowledge. The second criterion was to choose the most complete answers. For nine local governments, these criteria were insufficient, so the selection was based on preferring the response of the person with the higher position, as this person might have a better overview of the CE policy. To avoid biases, the influence of this last criterion on the results was checked, showing no significant differences. The representativity of the sample was then tested using t-tests comparing the proportions of local governments from the different regions and provinces in the sample to the whole population. Representativity was also tested in terms of mean surface and number of inhabitants. Late-response bias was tested for

responses after the reminder. Next, a descriptive analysis was performed on the pseudonymized data, calculating the degree of adoption of the CE, the mean scores, and the standard deviation for the survey elements (see Table 2). To test if the CE adoption by local governments in Belgium was similar for all or if different groups could be identified, a cluster analysis was performed using a two-step procedure as in previous research (Longoni & Cagliano, 2015). The first step was to use hierarchical clustering to determine the optimal number of clusters. This was done using the `clValid` function in R and using the Euclidean distance metric. Secondly, the K-means algorithm was used as a more robust methodology to assign observations and calculate the centers (Hair et al., 2013). The `kmeans` function in R was performed on the normalized data, where for each question, the respondent's mean was deducted from its answers. For example, if the respondent gave scores of 3, 4, 4, and 5 for four elements of a question, the respondent's mean for the question would be four. After deducting the mean, the normalized scores are -1, 0, 0, and +1, showing that the first element scored lower than average and the fourth element had a higher-than-average importance. This removes the effect of respondents who always use higher scores and facilitates analyzing relative differences within questions.

Using t-tests, significant differences between the centers of both clusters were determined and used for interpreting the clusters. Finally, the two groups were compared in terms of level of urbanization, region, size, and number of inhabitants.

[INSERT TABLE 1 HERE]

Results

In total, 509 responses were received. After cleaning, 309 useful responses remained, corresponding to a response rate of 54%. This response rate is high compared to similar studies (e.g., Eikelenboom & de Jong, 2022 (12%); Klein et al., 2022 (41%); Longoni & Cagliano, 2015

(16%); Mura et al., 2020 (16%); Ormazabal et al., 2018 (13%); Park & Krause, 2021 (37%)). Responses mainly came from people working in the administration (70%), being general directors, heads of departments, municipal officers, and project collaborators. The other 30% of the responses came from mayors, alderpersons, and cabinet members. The sample proved to be representative in terms of the different regions, provinces, and mean surface. However, an overrepresentation was found for municipalities with more inhabitants. This could be because these are larger local governments, with possibly more time and people to participate. No late-response bias was observed.

To the question if the CE was considered in the local government, 182 (59% of total useful responses) responded positively. This percentage is likely to be an overestimation compared to the whole population because of the self-selection nature, where local governments considering the CE were more likely to participate. In addition, the sample is overrepresented in terms of highly populated municipalities, and smaller municipalities can be expected to be less likely to have adopted the CE because they have fewer resources. However, this implies that at least 182 out of the 581 (31,3%) Belgian local governments consider the CE. The survey did not specify what considering the CE means, as this was questioned later in the survey. As expected, a positive but rather small correlation was found for considering the CE and the number of inhabitants ($r = 0,19$) and the surface ($r = 0,07$).

Of the 182 local governments that said to consider the CE, 124 fully completed the survey, allowing these to be further analyzed. The results of calculating the mean score, standard deviation, and mean normalized score can be found in Table 2. The mean score for almost all elements is rather high due to questioning elements that were found to be important in previous exploratory research.

Cluster analysis

The hierarchical cluster analysis found an optimal number of two clusters. For two clusters, a connectivity index of 2.93 was obtained, a Dunn index of 0.63, and a Silhouette value of 0.30. The positive Silhouette value implies some level of confidence for the clustering assignment. However, as was expected, the value is rather small because of the high number of variables. The kmeans function assigned observations almost equally to both clusters, having 64 (52%) observations in cluster 1 and 60 (48%) observations in cluster 2. An overview of the centers for both clusters is provided in Table 2 & 3, and the centers are visualized Figure 1. From the graph, it becomes clear that for some elements, both clusters are very close, while for others, the difference is larger. The significance of this difference was tested and is shown for a 5% and 1% significance level in Table 2.

Similarities

First, the results are discussed where no significant difference was found between both clusters. This implies that these findings are true for the whole sample. Results are discussed in terms of their normalized centers and ranking to show the content, context, and process of the CE adoption.

The lack of funding was the most important barrier for the local governments' **internal context**, followed by a lack of knowledge and awareness. The lack of political support has a lower-than-average score. However, the Likert score shows that this barrier is still rated 3,44 on average, so it is still an important barrier, although not the most important. For the drivers to adopt the CE, both clusters differ significantly, except for using the CE to improve the municipality's reputation,

which had a more than average importance. For the **external context**, municipalities in both clusters had no significantly different mean population.

The **content** of both clusters was characterized by having local production as the most important CE aspect of the local policy. This was not surprising as this is core to local governments. The third and fourth most important aspect in both clusters were conservation and closing material cycles with above-average importance rates, although in the opposite order. For both, sharing of resources scored below average importance. Regarding important product value chains, construction and building were the second most important elements. Packaging and plastics scored below average importance.

The adoption **process** differed significantly regarding important stakeholders to involve in the implementation, although the mean Likert score suggested similar values. For both clusters, leading by example was among the most important policy instruments. Legislation and taxation and stimulating bottom-up initiatives by citizens scored less than average importance. In both clusters, connecting stakeholders was the least important.

Overall, the local governments differ in the important drivers to adopt the CE but experience similar barriers. For the CE, local production and the building industry are most important, and local governments set higher importance on an active role of leading by example than stimulating others.

Differences

Here, the elements are discussed where the cluster centers were significantly different.

The local governments' **internal context** differed in importance given to the lack of appropriate regulation, taxation, and policies to adopt the CE. In cluster 1, this was the least important element, while for cluster 2, it is around average. For the drivers to adopt the CE,

tackling climate change and other environmental issues were scored highest for both clusters, although significantly higher in cluster 2. Improving the social situation was also scored more than averagely important, while economic opportunities were scored less than average for both, with a significantly lower score in cluster 1. Both pressure from higher levels of government and citizens or other stakeholders were the least important in cluster 2. Cluster 1 had tackling material scarcity as the least important driver.

The **external context** of municipalities in both clusters was found to be significantly different in terms of surface and region. Cluster 1 contains a larger proportion of Flemish municipalities, while cluster 2 contains more Walloon. The mean size of municipalities in cluster 2 is also significantly higher. Given that the mean population of both clusters was similar, this implies that municipalities in cluster 2 are less densely populated. This is also shown by the higher number of rural municipalities in cluster 2. A rural municipality has a population density lower than 150 inhabitants per square kilometer.

Regarding the **content**, servitization, and virtualization was the second most important CE aspect for cluster 1, while being the least important in cluster 2. In the latter, renewable resources was the second most important element while less than average important in cluster 1. Efficiency was the least important aspect in cluster 1 and below average in cluster 2. Both had food, water & nutrients as the most important value chain, but its importance was significantly higher for cluster 2. Electronics & ICT and batteries & vehicles were among the least important value chains in cluster 2, while more than averagely important in cluster 1. Textile was less than averagely important for both clusters but significantly lower in cluster 1.

For the **process**, both groups strongly differ in the level of importance of different stakeholder groups to involve in the implementation of the CE. For cluster 1, civil society and

governments were the most important, while least important for cluster 2. Here, businesses and knowledge institutions were most important. For the policy instruments, cluster 1 has funding as most important while only around average importance in cluster 2. Both clusters have informing and awareness raising as second most important instrument, with a significantly higher score for cluster 1. Strategic positioning was of above-average importance to cluster 2, while below for cluster 1. Stimulating innovation was the least important instrument for both, with even lower importance for cluster 1.

Overall, **cluster 1** consisted of a large proportion of Flemish and more urbanized municipalities. For these local governments, the classical drivers of tackling material scarcity and creating economic opportunities were not the most important. This was reflected by having civil society as most important stakeholder to implement the CE and not businesses. Here, the role of governments was also high and consists mainly of providing funding and information. Servitization and virtualization were also important aspects of the CE in this cluster, which matched the importance of the value chains of electronics and ICT, and batteries and vehicles.

Cluster 2 consisted of more Walloon and less densely populated municipalities. Here, local governments adopted the CE to improve the environmental and social situation, not just because of pressure from others. Food, water & nutrients stood out in this cluster as most important value chain for the CE. The focus for implementing the CE was mainly on businesses and knowledge institutions. Therefore, the role of the local government was more to inform, raise awareness and give direction.

[INSERT TABLE 2 HERE]

[INSERT TABLE 3 HERE]

[INSERT FIGURE 1 HERE]

Discussion

The proportion of local governments that adopted the CE (59%) was higher than expected, given that at the time of sending the survey, only four Belgian local governments signed the Circular City Declaration. However, this proportion is likely to be an overestimation because of the self-selection nature of this survey. Although the context, content, and process are presented separately, they are linked and should be interpreted jointly.

Similarities

For the **context**, to overcome barriers to adopting the CE, local governments need especially funding and knowledge. Funding was also found to be a key barrier to adopting the CE in the local governments studied by Prendeville et al. (2018). The lack of knowledge and awareness was also found to be a key barrier to the circular strategy of Melbourne and Malmö in the study of Bolger and Doyon (2019), in the Portuguese central public sector (Klein et al., 2021b), and in European frontrunner cities (Montenegro Navarro & Jonker, 2018). Businesses also encounter these financial and knowledge-related barriers when adopting the CE (Mura et al., 2020; Piila et al., 2022). Adopting the CE can also improve an organization's reputation (Ormazabal et al., 2018). For Belgian local governments, this driver was also more than averagely important. Nevertheless, it should be avoided that the CE is only used for greenwashing and city-branding, not resulting in real change towards strong sustainability (Prendeville et al., 2018).

The **content** shows what aspects of the CE local governments are considering. Knowing this can help provide specific support to local governments and show what aspects are omitted. Aspects of the CE could be omitted because they are less relevant to the local context or because

local governments are unaware of its potential. Local production was the most important aspect of the CE, which is not surprising as this is of great interest to the local government. This finding can also be linked to the high importance of the value chains of food, water, and nutrients, which are partly local responsibilities. Buildings and construction was also of high importance. Together, these value chains were found to have the highest potential for the CE to reduce the material and carbon footprints of the Brussels Region (Christis et al., 2019). Local production in itself, will not result in strong sustainability, as it is not reducing consumption nor production. However, other high-value R strategies, conservation and reusing, and closing material loops were also highly important showing that not just weak sustainability is pursued.

For the **process** of implementing the CE, high levels of importance were given to all four stakeholder groups, reflecting the need to involve the quadruple helix to create system changes (Carayannis & Campbell, 2009; Levoso et al., 2020; Paiho et al., 2020). Different policy instruments could be needed depending on what stakeholder is considered important for implementing the CE. Leading by example was most important for the Belgian local governments, as expected by a public sector organization. This implies that circular procurement is an important step in implementing the CE internally (Bolger & Doyon, 2019).

Differences

Moving to the differences observed in the **context**, the drivers for adopting the CE differed among the two clusters. For cluster 1, material scarcity and economic opportunities were least important, although being the main foundation of the CE (Ghisellini et al., 2016). Cluster 2 had both types of pressure as least important drivers, showing that the CE is seen as a solution more than an obligation, which was also observed in the Portuguese public sector (Klein et al., 2021b). Regarding the triple bottom line, the environmental dimension, through tackling climate change

and other environmental issues, was most important and especially for cluster 2. Environmental motivations were also observed as key to adopting the CE in the study of Prendeville et al. (2018).

The social dimension was also more than averagely important, unlike other CE policies that often neglect social issues (Corvellec et al., 2021). This shows that local governments are adopting the CE in the pursuit of strong sustainability.

For the **content** of cluster 1, servitization & digitalization was among the most important elements, while least important for cluster 2. This corresponds to having electronics and ICT, and vehicles and batteries as most important value chains in cluster 1. A similar focus was observed in Barcelona, where the smart and circular urban agenda were strongly linked (Prendeville et al., 2018). The synergies of smart and circular transitions are often recognized as complementary and referred to as the twin transition (Crippa et al., 2023; European Commission, 2023).

The clusters also differed in most important stakeholders to involve and policy instruments to use. The **process** of cluster 1 corresponds again to Barcelona, where the inclusion of civil society was found to be key (Prendeville et al., 2018). This can also be considered a form of strong circularity, where not just businesses are responsible (Johansson & Henriksson, 2020). Here, the most important policy instruments were providing funding, and informing and raising awareness, corresponding to an enabling role as local government supporting bottom-up initiatives (Coskun et al., 2022; OECD, 2020). Cluster 2 has a more business-centric approach, relying on the market to solve problems with innovation and where governments have a less important role. This corresponds to the strategy adopted by Glasgow and Rotterdam to achieve a strong economy for the city (Prendeville et al., 2018). However, governments should not omit their own role and the importance of civil society, especially with the growing importance of collaborative governance to deal with wicked problems like climate change (Alford & Greve, 2017). Although the different

focus on stakeholders to implement the CE provides a distinction between a more business-centric versus society-driven approach, the two groups contain elements of both weak and strong sustainability.

Implications

These findings provide insights into the adoption of the CE by a large number of local governments. Understanding this process is key for moving from ambitions to action. Moreover, this study tested claims by previous exploratory research on important elements for implementing the CE locally. By reflecting on the most important elements of the CE, insights were gained whether local governments pursue more weak or strong sustainability.

The two identified clusters imply that the CE is not implemented similarly for all local governments. By providing insights into the context, content, and process, governments of all levels and consultants can support local governments to overcome the barriers by building on what drives them while focusing on their priorities. It provides a starting point for future research and can be used to inspire other local governments. At the same time, the results allow to identify where the potential of the CE might be ignored by local governments because of a lack of knowledge and awareness or the lack of resources. The results are specific to Belgium but might well relate to other EU member states facing similar ambitions. Nevertheless, this study also provides a survey that can be used in other geographical areas or organizations to study the CE.

Limitations

Although the survey was designed to minimize biases, some limitations must be enclosed. For every local government, only one response was used, making results vulnerable to personal perceptions. The self-selection bias also needs to be considered when interpreting the results and

the overrepresentation of highly populated municipalities. This study aimed to provide insights from a large set of observations and, therefore, could not be as in-depth as case studies. In addition, focusing on only one country makes part of these findings country-specific.

Future Research

These limitations provide opportunities for future research to adopt this survey in other geographical areas or types of organizations and to survey the alignment of perceptions inside the organization. More in-depth and longitudinal research can also be used to get a better understanding of the implementation of the CE and the influence of, for example, politics, change agents, and the socio-economic context on the outcomes. By studying outcomes, best practices can be identified to support the further implementation of the CE.

Conclusion

The CE is gaining rapidly in popularity because of its promise to contribute to a sustainable future. To become climate neutral, the European Union made the CE a key priority (European Commission, 2019). EU members all have their part in implementing the CE, and not only national but also local governments will need to act. Local governments can be important drivers of this transition. They bring together local stakeholders needed to make system changes. They can translate the vagueness of the CE into concrete policies that fit the local context. As the government closest to citizens, this allows involving citizens in co-creation. Moreover, local governments are responsible for key domains of the CE, such as waste management and the local economy. Nevertheless, the literature review shows that research on this topic is still limited and mainly exploratory. Therefore, this study developed a survey based on these exploratory findings to test them among a large number of local governments by questioning the context, content, and process

of the CE adoption. The survey was sent to all 581 Belgian local governments and resulted in a response rate of 54%. This high response rate reflected a wide interest among local governments. In total, 182 (59%) of these local governments are considering the CE. Although this percentage is likely to be an overestimation because of self-selection bias, this shows that many local governments have adopted the CE, while certainly not all of them, showing the need to further support local governments in implementing the CE. Implementation requires taking away barriers. Local governments who had adopted the CE gave high importance to all four types of barriers, especially stressing the lack of funding, knowledge, and awareness. The reasons for adopting the CE were surprising as the classical, more weak sustainability, motivations of the CE to create economic opportunities and tackle material scarcity, were not prioritized. Adopting the CE because of stakeholder pressure was also not the most important. The CE was mainly adopted as an opportunity to tackle climate change and other environmental issues, but also to improve the social situation, in line with EU policy and strong sustainability. However, local governments also focused on local production as most important part of the CE, which do not support strong circularity if production is not reduced. The most important value chains are food, water, and nutrients. Local food production and short circuit are a part of the CE where local governments play a key role. The most important instruments for local governments to implement the CE are enabling instruments such as providing funding and information and, to a lesser extent, legal and tax-related actions. Besides, leading by example was considered the most important role for local governments.

However, this study wanted to avoid suggesting that all local governments will do the same when adopting the CE. This would conflict with the argument that local governments can translate the CE into policies that fit the local context. Using cluster analysis, two groups were identified,

for which significant differences are identified. A key difference is the importance given to different groups of stakeholders for implementing the CE. In one group, businesses were the most important, reflecting a business-centric view, and here the local government had a less important role, mainly providing strategic direction. For the other group, civil society was most important, and the government had a supportive role by providing funding. This shows that the CE is adopted for more strong sustainability, requiring a societal transformation. For this group, smart-related value chains and CE aspects were important, showing the importance of the twin transition. The different groups relate to the two main Belgian regions and differ in urbanization levels, suggesting that the external context of a local government could influence how the CE is adopted. The aim is not to say whether one group is better than the other, as the context determines what is appropriate. Only by studying future outcomes, it will be possible to observe best practices.

The survey proved useful for analyzing the adoption of the CE by a large number of local governments. Many results supported previous exploratory findings from other local governments and even businesses. Both practitioners and researchers can use these findings and methods to support the further adoption of the CE by local governments worldwide.

Declaration of Conflicting Interests

The authors declare to have no conflicts of interest.

References

- Alford, J., & Greve, C. (2017). Strategy in the Public and Private Sectors: Similarities, Differences and Changes. *Administrative Sciences*, 7(4), Article 4. <https://doi.org/10.3390/admsci7040035>
- Belgian Federal Government. (2021). *Federal Action Plan Circular Economy 2021-2024*. <https://www.health.belgium.be/en/node/41030>
- Bocken, N., Miller, K., & Evans, S. (2016). *Assessing the environmental impact of new Circular business models*.
- Bolger, K., & Doyon, A. (2019). Circular cities: Exploring local government strategies to facilitate a circular economy. *European Planning Studies*, 27(11), 2184–2205. <https://doi.org/10.1080/09654313.2019.1642854>
- Braungart, M., & McDonough, W. (2002). *Cradle to Cradle: Remaking the Way We Make Things*. North Point Press.
- Brussels-Capital Region. (2016). *Brussels Regional Program for a Circular Economy 2016-2020*.
- Carayannis, E., & Campbell, D. (2009). ‘Mode 3’ and ‘Quadruple Helix’: Toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management - INT J TECHNOL MANAGE*, 46. <https://doi.org/10.1504/IJTM.2009.023374>
- Christis, M., Athanassiadis, A., & Vercauteren, A. (2019). Implementation at a city level of circular economy strategies and climate change mitigation – the case of Brussels. *Journal of Cleaner Production*, 218, 511–520. <https://doi.org/10.1016/j.jclepro.2019.01.180>
- Corvellec, H., Stowell, A. F., & Johansson, N. (2021). Critiques of the circular economy. *Journal of Industrial Ecology*, 12, Article n/a. <https://doi.org/10.1111/jiec.13187>
- Coskun, A., Metta, J., Bakırlıoğlu, Y., Çay, D., & Bachus, K. (2022). Make it a circular city: Experiences and challenges from European cities striving for sustainability through promoting circular making. *Resources, Conservation and Recycling*, 185, 106495. <https://doi.org/10.1016/j.resconrec.2022.106495>
- Crippa, J., Silva, M. G., Ribeiro, N. D., & Ruschel, R. (2023). Urban branding and circular economy: A bibliometric analysis. *Environment, Development and Sustainability*, 25(3), 2173–2200. <https://doi.org/10.1007/s10668-022-02173-1>
- Eikelenboom, M., & de Jong, G. (2022). The Impact of Managers and Network Interactions on the Integration of Circularity in Business Strategy. *Organization & Environment*, 35(3), 365–393. <https://doi.org/10.1177/1086026621994635>
- Elkington, J. (1997). *Cannibals With Forks: The Triple Bottom Line of 21st Century Business*. Capstone.
- Ellen MacArthur Foundation. (2015). *Towards a Circular Economy: Business rationale for an accelerated transition*. <https://emf.thirdlight.com/link/ip2fh05h21it-6nvypm/@/preview/1?o>
- European Commission. (2019). *A European Green Deal*. https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en
- European Commission. (2020). *A New Circular Economy Action Plan*. https://ec.europa.eu/environment/strategy/circular-economy-action-plan_nl
- European Commission. (2021). *Circular cities and regions initiative*. European Commission - European Commission. https://ec.europa.eu/info/research-and-innovation/research-area/environment/circular-economy/circular-cities-and-regions-initiative_en

- European Commission. (2023). *Green digital sector | Shaping Europe's digital future*.
<https://digital-strategy.ec.europa.eu/en/policies/green-digital>
- European Investment Bank. (2018). *15 Circular Steps for Cities*.
https://www.eib.org/attachments/thematic/circular_economy_15_steps_for_cities_en.pdf
- Figge, F., Thorpe, A. S., & Gutberlet, M. (2023). Definitions of the circular economy: Circularity matters. *Ecological Economics*, 208, 107823.
<https://doi.org/10.1016/j.ecolecon.2023.107823>
- Flemish Regional Government. (2018). *Vision 2050. A Long-Term Strategy for Flanders*.
<https://www.vlaanderen.be/publicaties/vision-2050-a-long-term-strategy-for-flanders>
- 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>
- 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>
- Hair, J. F. Jr., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate Data Analysis* (Seventh Edition). Pearson.
- Hood, C. (1991). A Public Management for All Seasons? *Public Administration*, 69(1), 3–19.
<https://doi.org/10.1111/j.1467-9299.1991.tb00779.x>
- ICLEI Europe. (2023). *Circular Cities Declaration: Current Signatories*.
<https://circularcitiesdeclaration.eu/current-signatories>
- Johansson, N., & Henriksson, M. (2020). Circular economy running in circles? A discourse analysis of shifts in ideas of circularity in Swedish environmental policy. *Sustainable Production and Consumption*, 23, 148–156. <https://doi.org/10.1016/j.spc.2020.05.005>
- Kębłowski, W., Lambert, D., & Bassens, D. (2020). Circular economy and the city: An urban political economy agenda. *Culture and Organization*, 26(2), Article 2.
<https://doi.org/10.1080/14759551.2020.1718148>
- Kirchherr, J., Reike, D., & Hekkert, M. P. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, 127, 221–232.
<https://doi.org/10.1016/j.resconrec.2017.09.005>
- Klein, N., Deutz, P., & Ramos, T. B. (2022). A survey of Circular Economy initiatives in Portuguese central public sector organisations: National outlook for implementation. *Journal of Environmental Management*, 314, 114982.
<https://doi.org/10.1016/j.jenvman.2022.114982>
- Klein, N., Ramos, T. B., & Deutz, P. (2020). Circular Economy Practices and Strategies in Public Sector Organizations: An Integrative Review. *Sustainability*, 12(10), Article 10.
<https://doi.org/10.3390/su12104181>
- Klein, N., Ramos, T. B., & Deutz, P. (2021a). Factors and strategies for circularity implementation in the public sector: An organisational change management approach for sustainability. *Corporate Social Responsibility and Environmental Management*, 29(3), 509–523. Scopus. <https://doi.org/10.1002/csr.2215>
- Klein, N., Ramos, T. B., & Deutz, P. (2021b). Factors and strategies for circularity implementation in the public sector: An organisational change management approach for sustainability. *Corporate Social Responsibility and Environmental Management*.
<https://doi.org/10.1002/csr.2215>

- Koro, M., Douglas, E., Therriault, D., Malcolm, Z., & McNeill, N. (2012). Reconceptualizing and decentering think-aloud methodology in qualitative research. *Qualitative Research, 13*, 735–753. <https://doi.org/10.1177/1468794112455040>
- Levosio, S. A., Gasol, C. M., Martínez-Blanco, J., Durany, X. G., Lehmann, M., & Gaya, R. F. (2020). Methodological framework for the implementation of circular economy in urban systems. *Journal of Cleaner Production, 248*, 119227. <https://doi.org/10.1016/j.jclepro.2019.119227>
- Longoni, A., & Cagliano, R. (2015). Environmental and social sustainability priorities: Their integration in operations strategies. *International Journal of Operations & Production Management, 35*(2), 216–245. <https://doi.org/10.1108/IJOPM-04-2013-0182>
- Montenegro Navarro, N., & Jonker, J. (2018). *Circular City Governance—An explorative research study into current barriers and governance practices in circular city transitions in Europe*.
- Mura, M., Longo, M., & Zanni, S. (2020). Circular economy in Italian SMEs: A multi-method study. *Journal of Cleaner Production, 245*, 118821. <https://doi.org/10.1016/j.jclepro.2019.118821>
- OECD. (2020). *The Circular Economy in Cities and Regions: Synthesis Report*. OECD Urban Studies. <https://www.oecd.org/regional/the-circular-economy-in-cities-and-regions-10ac6ae4-en.htm>
- Ormazabal, M., Prieto-Sandoval, V., Puga-Leal, R., & Jaca, C. (2018). Circular Economy in Spanish SMEs: Challenges and opportunities. *Journal of Cleaner Production, 185*, 157–167. <https://doi.org/10.1016/j.jclepro.2018.03.031>
- Paiho, S., Mäki, E., Wessberg, N., Paavola, M., Tuominen, P., Antikainen, M., Heikkilä, J., Rozado, C. A., & Jung, N. (2020). Towards circular cities—Conceptualizing core aspects. *Sustainable Cities and Society, 59*, 102143. <https://doi.org/10.1016/j.scs.2020.102143>
- Park, A. Y. S., & Krause, R. M. (2021). Exploring the landscape of sustainability performance management systems in U.S. local governments. *Journal of Environmental Management, 279*, 111764. <https://doi.org/10.1016/j.jenvman.2020.111764>
- Petit-Boix, A., & Leipold, S. (2018). Circular economy in cities: Reviewing how environmental research aligns with local practices. *Journal of Cleaner Production, 195*, 1270–1281. <https://doi.org/10.1016/j.jclepro.2018.05.281>
- Pettigrew, A. M. (1985). Contextualist research and the study of organizational change processes. *Doing Research That Is Useful for Theory and Practice, 20*.
- Piila, N., Sarja, M., Onkila, T., & Mäkelä, M. (2022). Organisational Drivers and Challenges in Circular Economy Implementation: An Issue Life Cycle Approach. *Organization & Environment, 35*(4), 523–550. <https://doi.org/10.1177/10860266221099658>
- Podsakoff, P., MacKenzie, S., Lee, J.-Y., & Podsakoff, N. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *The Journal of Applied Psychology, 88*, 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Potting, J., Hekkert, M. P., Worrell, E., & Hanemaaijer, A. (2017). Circular Economy: Measuring Innovation in the Product Chain. *Planbureau Voor de Leefomgeving, 2544*. <http://dspace.library.uu.nl/handle/1874/358310>
- 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>

- Sauvé, S., Bernard, S., & Sloan, P. (2016). Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. *Environmental Development*, 17, 48–56. <https://doi.org/10.1016/j.envdev.2015.09.002>
- Van Hengel, H., Budding, T., & Groot, T. (2014). Loosely Coupled Results Control in Dutch Municipalities. *Financial Accountability & Management*, 30(1), Article 1. <https://doi.org/10.1111/faam.12027>
- Vanhuyse, F., Haddaway, N. R., & Henrysson, M. (2021). Circular cities: An evidence map of research between 2010 and 2020. *Discover Sustainability*, 2(1), 50. <https://doi.org/10.1007/s43621-021-00059-2>
- Wallonia Public Service. (2021). *Circular Wallonia: Deployment Strategy of the Circular Economy in Wallonia*.

Appendix

Appendix 1: Survey questions

[INSERT TABLE 4 HERE]

Table 1*Survey Elements Questioned Using Likert-scale for Importance*

	Elements	Reference
Context	<p>1) Funding (for investing, financing initiatives, hiring people)</p> <p>2) Knowledge and awareness (about what the concept is, why it is important, how to realize it, too narrow vision of circularity)</p> <p>3) Regulation, taxation, and policies (short-term focused, promoting consumption, made in isolation)</p> <p>4) Political support</p>	Adapted from (Montenegro Navarro & Jonker, 2018)
	<p>1) Pressure from citizens or other local stakeholders</p> <p>2) Pressure from higher levels of government (regional, national, European)</p> <p>3) Economic opportunities (for businesses, creating jobs)</p> <p>4) To tackle climate change</p> <p>5) To tackle material scarcity</p> <p>6) To tackle other environmental issues (pollution, biodiversity loss)</p> <p>7) To improve the social situation (inclusion, quality of life, equality)</p> <p>8) To improve the municipality's image/reputation</p>	<p>Bottom-up vs. top-down (Prendeville et al., 2018)</p> <p>Triple Bottom Line (Elkington, 1997)</p> <p>(Fratini et al., 2019)</p>
Content	<p>1) Conservation (keeping products in use for as long as possible to avoid the need for new products and new materials)</p> <p>2) Reuse and closing of material cycles (no more waste, but materials kept at their highest value in the economy for as long as possible)</p> <p>3) Sharing of resources (sharing goods to reduce the need for goods and thereby the materials needed and waste generated)</p> <p>4) Servitization and virtualization (digitalizing goods or providing them as a service to reduce the need for materials)</p> <p>5) Efficiency (improving the efficiency of production so that minimal inputs are needed and no resources are wasted)</p> <p>6) Renewable resources (using renewable resources instead of primary raw materials)</p> <p>7) Local production (to minimize the impact of transport)</p>	(Paiho et al., 2020)

4) Product value chains	<ol style="list-style-type: none"> 1) Electronics & ICT 2) Batteries & vehicles 3) Packaging 4) Plastics 5) Textiles 6) Construction & buildings 7) Food, water & nutrients 	New Circular Economy Action Plan (European Commission, 2020)
5) Actors	<ol style="list-style-type: none"> 1) Businesses 2) Knowledge institutions 3) Governments 4) Civil society 	Quadruple helix (Carayannis & Campbell, 2009)
Process 6) Instruments	<ol style="list-style-type: none"> 1) Funding (providing financial support or helping to find funding from external sources) 2) Informing (educating stakeholders to raise awareness, studying the local material flows, gathering data and monitoring, and sharing good practices) 3) Legislation and taxation (by lobbying together with other cities for better regulation, improving the local regulation, and using taxation to provide incentives) 4) Strategic positioning (defining a clear vision, mission, strategy, and ambition together with stakeholders and political support) 5) Leading by example (using circular public procurement, breaking internal silos) 6) Stimulate innovation (create experimentation zones) 7) Stimulating bottom-up initiatives by citizens (with financial support, providing training, offering locations or materials) 8) Connecting stakeholders (to stimulate (interdisciplinary) collaboration) 	Adapted from (Montenegro Navarro & Jonker, 2018)

Table 2*Results for Survey Elements*

	Elements	Mean	SD	Mean (Norm.)	Cluster 1	Cluster 2
1) Barriers	1) Funding	3.78	0.96	0.24	0.31 (1)	0.16 (1)
	2) Knowledge	3.60	0.92	0.04	0.05 (2)	0.04 (2)
	3) Regulation	3.40	0.96	-0.17	-0.31 (4)**	-0.01 (3)**
	4) Political support	3.44	1.09	-0.12	-0.05 (3)	-0.19 (4)
Context 2) Drivers	1) Citizens pressure	3.29	0.97	-0.40	-0.06 (6)**	-0.76 (7)**
	2) Governments pressure	3.26	0.97	-0.43	0.05 (5)**	-0.94 (8)**
	3) Economic	3.59	1.04	-0.10	-0.14 (7)	-0.06 (6)
	4) Climate	4.07	0.89	0.38	0.23 (1)**	0.54 (1)**
	5) Material	3.58	1.01	-0.11	-0.47 (8)**	0.28 (4)**
	6) Environment	4.01	0.84	0.32	0.13 (3)**	0.53 (2)**
	7) Social	3.88	0.89	0.19	0.05 (4)**	0.34 (3)**
	8) Branding	3.83	0.89	0.14	0.22 (2)	0.06 (5)
Content 3) Circular aspects	1) Extend	3.69	0.92	0.06	0.09 (3)	0.02 (4)
	2) Reuse	3.70	0.97	0.06	-0.01 (4)	0.14 (3)
	3) Share	3.55	0.94	-0.09	-0.05 (5)	-0.13 (6)
	4) Service	3.41	0.99	-0.23	0.18 (2)**	-0.66 (7)**
	5) Efficient	3.45	1.04	-0.19	-0.30 (7)**	-0.06 (5)**
	6) Renewable	3.72	1.05	0.08	-0.13 (6)**	0.30 (2)**
	7) Local	3.94	0.92	0.31	0.23 (1)	0.39 (1)
Content 4) Product value chains	1) ICT	3.37	0.96	-0.11	0.09 (4)**	-0.32 (7)**
	2) Vehicles	3.41	0.95	-0.07	0.12 (3)**	-0.27 (6)**
	3) Packaging	3.44	1.05	-0.03	-0.07 (5)	0.00 (3)
	4) Plastics	3.33	1.15	-0.15	-0.21 (6)	-0.08 (4)
	5) Textile	3.18	1.05	-0.30	-0.46 (7)**	-0.13 (5)**
	6) Building	3.72	0.95	0.24	0.23 (2)	0.25 (2)

		7) Food	3.90	0.90	0.42	0.29 (1)**	0.55 (1)**
Process	5) Actors	1) Business	3.94	0.99	0.01	-0.07 (3)*	0.11 (1)*
		2) Research	3.85	0.97	-0.08	-0.15 (4)*	-0.01 (2)*
		3) Government	3.96	0.81	0.03	0.10 (2)*	-0.04 (3)*
		4) Society	3.97	0.79	0.04	0.13 (1)*	-0.06 (4)*
	6) Instruments	1) Finance	4.27	0.71	0.31	0.58 (1)**	0.02 (4)**
		2) Informing	4.25	0.66	0.29	0.39 (2)**	0.19 (2)**
		3) Legal	3.82	0.85	-0.14	-0.16 (6)	-0.11 (6)
		4) Strategy	3.90	0.80	-0.06	-0.14 (5)*	0.04 (3)*
		5) Example	4.28	0.66	0.32	0.33 (3)	0.32 (1)
		6) Innovation	3.49	0.99	-0.47	-0.69 (8)**	-0.23 (8)**
		7) Bottom-up	3.86	0.84	-0.10	-0.10 (4)	-0.10 (5)
		8) Connect	3.79	1.00	-0.17	-0.21 (7)	-0.13 (7)

** The value of both clusters is significantly different at a 1% confidence level

* The value of both clusters is significantly different at a 5% confidence level

() The rank of the element for that question, where 1 is the most important

Table 3*External Context for Clusters*

Characteristics	Cluster 1	Cluster 2	Full sample
#observations	64 (52%)	60 (48%)	124
#rural	9 (31%)**	20 (69%)**	29
#urban	55 (58%)**	40 (42%)**	95
#Walloon	21 (37%)**	36 (63%)**	57
#Flemish	38 (63%)**	22 (37%)**	60
#Brussels	5 (71%)	2 (29%)	7
Mean population	35902	28820	32475
Mean surface (km ²)	49,10**	71,77**	60,07

** *The value of both clusters is significantly different at a 1% confidence level*

* *The value of both clusters is significantly different at a 5% confidence level*

Table 4*Survey Questions*

Introductory	
0.1)	What is the name of the municipality that you work for? (drop-down menu)
0.2)	What is your function in this municipality? (multiple choice)
0.3)	Is the circular economy considered in your local government? (yes/no)
Context	
1)	To what extent were the aspects below important barriers to the adoption of the circular economy on the agenda of your local government? (Likert-scale)
2)	To what extent are the reasons below important drivers for adopting the circular economy on the agenda of your local government? (Likert-scale)
Content	
3)	To what extent are the elements below important to the circular economy policy of your local government? (Likert-scale)
4)	To what extent are the product value chains below important in the circular economy policy of your local government? (Likert-scale)
Process	
5)	To what extent are the groups below important stakeholders to involve in the implementation of the circular economy policy of your local government? (Likert-scale)
6)	To what extent are the instruments below important in the circular economy policy of your local government? (Likert-scale)

Figure 1

