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Unlocking Market Transformation Through Circular Procurement: The Amsterdam Metropolitan Area Experience

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Abstract: This paper hypothesizes that knowledge sharing and collaboration among procurers can positively impact markets for circular products and services. To test this hypothesis, this paper evaluates an urban-scale experiment conducted in the Amsterdam Metropolitan Area (AMA) from 2015 to 2024, involving 48 organizations. The circular procurement experiment was analyzed as a transition process facilitated by intermediaries. Detailed documentation was collected, including meeting minutes and individual interviews. No previous empirical studies cover a nine-year period and address all three levels: the micro-level of individual organizations, the meso-level (supply chain), and the macro-level (national), while also describing the transition process in detail. The qualitative analysis reveals the limitations of achieving significant impact by individual procurers, as well as the potential to fundamentally transform product chains at the meso-level (supply chain) and the macro-level (national) through a collective approach. The findings include a systematic overview of the scope of circular procurement, as well as the preconditions and enablers at the micro-, meso-, and macro-levels necessary to foster innovation and markets for circular products and services. Only a limited number of barriers are key to accelerating circular procurement. Based on the findings, a structured, practical guide for implementing circular procurement is provided.

Keywords: circular procurement; longitudinal urban-scale experiment; preconditions and key enablers at the micro-, meso-, and macro-level; supply chain transformation; policy instruments; practical guide

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1. Introduction

Circular procurement (CP) is regarded as a crucial tool for transforming production and consumption patterns from linear to circular [1]. Through the purchasing power of procurers, the market can be encouraged to develop more circular products and adopt circular business models [2,3]. This purchasing power is significant, as public expenditure in various countries ranges from approximately 12% to 22% of gross domestic product (GDP). The Organization for Economic Co-operation and Development (OECD) estimates that public procurement accounts for around 12% of GDP in its member countries, and it reaches approximately 30% of GDP in many developing countries [2]. For Europe as a whole, public procurement amounts to approximately EUR 2 trillion annually, which is almost 14% of its GDP [1]. The scale of this public expenditure naturally creates opportunities to make an impact and serve as an economic driver in future developments [4]. This impact can be even greater when private-sector procurement aligns with circular ambitions [1].

Driven by the growing interest in the circular economy and circular supply chain management, research on CP has garnered increasing attention since 2018 [1]. Up until that point, the body of literature on CP had been limited [5]. Studies primarily focused on the sustainability aspect of procurement rather than specifically on circularity [1]. Recent research on circular procurement (CP) centers on defining circular procurement and distinguishing it from sustainable procurement (SP) and green procurement (GP) [1,5–7]. Additionally, attention is given to integrating the circular economy into

procurement practices [8], exploring the impact of CP on the firms' sustainability performance [9–11], and investigating the influence of external pressures on the adoption of CP [9], as well as literature reviews on the barriers and enablers of CP [1,12]. Various authors acknowledge the potentially significant impact of CP [4,6], but they argue that its effectiveness depends on whether purchasing requirements are sufficiently ambitious to challenge the market and on how these requirements are implemented during the procurement process [4]. Discrepancies in the literature persist regarding the potential impact of CP on innovation and markets, primarily due to the challenges procurers face in supporting innovation practices within the private sector [7]. As long as procurers possess substantial purchasing power to drive innovation investment and competition, CP could be an effective instrument [7]. However, the extent to which procurers can push these boundaries remains underexplored in the literature.

To address this knowledge gap, this paper evaluates an urban-scale experiment aimed at creating a significant market transformation toward a circular economy through a coordinated CP initiative. The experiment was conducted in the Amsterdam Metropolitan Area (AMA) from 2015 to 2024, involving 48 public and private procurement departments and their organizations. Based on the CP literature [1,10], this study hypothesizes that knowledge sharing and collaboration among procurers can positively influence markets for circular products and services. Consequently, the in-depth, longitudinal analysis addresses the following questions: What was accomplished over nine years? What is the scope of these collaborative CP initiatives? And what preconditions and key enablers are necessary to achieve a significant impact on markets for circular products and services?

The implementation process was initiated by the Amsterdam Economic Board (AMEC), a triple-helix organization focused on promoting innovation and new business development in key urban challenges, including the circular economy. During the joint program's execution, meeting minutes, event records, individual interviews, and community of practice sessions were documented. This extensive dataset supports a qualitative analysis of the collaboration process among the 48 procurers involved, highlighting the preconditions and key enablers critical to achieving substantial impact on markets for circular products and services. The longitudinal analysis shows the limitations of achieving high impact by individual procurers at the micro-level and the constraints of fundamentally transforming product chains at the meso- and macro-levels through a collective, process-oriented approach. These insights have not been previously addressed in the literature.

First, the materials and methods of the in-depth analysis will be explained. Second, the literature on CP will be reviewed, leading to the development of a theoretical framework to analyze the experiences gained. Third, the empirical analysis, focusing on the implementation of CP in the AMA from 2015 to 2024, will be presented. Fourth, the outcomes of the large-scale experiment will be discussed in relation to the key questions raised up front and the theoretical framework originally developed. Additionally, an implementation approach will be designed that can be helpful for practitioners. Based on the findings, recommendations for future research will be proposed. Finally, conclusions will be drawn, including the study's limitations.

2. Materials and Methods

The paper examines the implementation of CP in the AMA over a nine-year period (2015–2024). The AMA encompasses a broad range of economic activities, has a population of approximately 2.4 million, and is strongly committed to fostering innovation and creativity. The CP initiative was carried out as part of a larger circular economy program established by the AMEC in 2015 [13]. The AMEC is a triple-helix organization that includes participation from industry, local government, and educational institutions. Throughout the implementation of the CP program, 6 educational institutions (including universities), 15 companies, and 27 local governments were involved. In the initial phase, the program was led by a team consisting of one AMEC board member (the author of this paper) and the AMEC's circular economy challenge lead. Both served as intermediaries, facilitating the

transition to CP by orchestrating the change process and coordinating the various actors involved. The significance of this independent role as a transition broker or change agent has been underscored in the literature [14,15]. In 2020, the intermediary team was replaced by two other board staff members, with the board member continuing in an advisory role. The CP program was executed in close collaboration with 27 local governments, which are coordinated by the Metropolitan Region of Amsterdam (MRA). The MRA identified the circular economy as a key priority, as local governments recognized the need to meet the circular economy targets set at the EU and national levels. CP was regarded as a crucial strategy to accelerate the transition to a circular economy.

The hypothesis driving the collective experiment within the AMA was to expand the market for circular products and services through a coordinated effort. Initially, potentially interested organizations were invited to join a learning program designed to enhance their knowledge, facilitate experience sharing, and guide them in taking initial steps toward implementing CP practices. After this educational phase, participants engaged in a reflective pause to discuss the outcomes achieved.

Following this reflection, organizations were encouraged to collaborate in creating markets for circular products and services by establishing a coordinated CP execution plan. The objective of this plan was to collectively steer the market toward circularity by applying consistent procurement requirements across a range of products. Simultaneously, three product chains were selected to form innovative alliances between procurers and firms within these chains. As discussed in the literature [9,10], it was anticipated that these collaborative arrangements would lead to a more substantial impact on circularity. Figure 1 summarizes the six distinct activities conducted over time.

Activities	Objective	Deliverables
Preparing the circular procurement program (2015-2016)	Raise awareness for the circular economy program (including circular procurement)	Minutes of 50 interviews and 5 group sessions
Building knowledge and competencies (2016-2019)	Build knowledge and competencies in three communities of practice (each 6 sessions): in total 31 participants	Minutes of 18 sessions, 3 final reports and 2 matchmaking events (not recorded)
Reflective pause (late 2019-2020)	Reflect upon the results obtained	12 informal conversations and 2 formal meetings (minutes) with participants; 2 AMEC meetings (minutes)
Establishing a coordinated circular procurement execution plan (2020-2022)	Find a common ground for a joint circular procurement execution plan	Package of environmental criteria for circular procurement; reporting system; approximately 30 informal conversations
Creating innovative alliances within specific product chains (2020-2021)	Enhance innovative, circular solutions in 3 supply chains	3 circular economy labs (ICT; dataservers; solar panels) (3 reports, video recording); follow-up activities organized nationally
Consolidating the program (2023-ongoing)	Integrate circular procurement into the organizational structure and culture of individual organizations and continue 3 supply chain initiatives at the national level	3 interviews with circular procurement coordinators of the AMEC and MRA (minutes)

Figure 1. Summary of the six distinct activities conducted over time, along with their corresponding data deliverables.

To analyze the implementation of the CP program in the AMA, an action-oriented research approach was adopted. The author of this paper was one of the persons directly involved in the execution of the program, particularly from 2015 to 2020. Through collaborative participation, scientifically and socially relevant knowledge was generated, along with transformative actions [16]. This approach enabled the author to closely observe the implementation process in practice while also interpreting the results as a reflective scientist [17].

The theoretical framework developed in Section 2 will guide the empirical analysis during the various stages of the implementation process. The results of this in-depth study provide insights into whether, under what preconditions, a significant market transformation toward a circular economy can be achieved through a coordinated CP initiative at the urban level. Additionally, it enriches the literature by identifying the most significant enablers in the different phases of the implementation process. For practitioners, this paper offers guidance on implementing CP by proposing a structured approach, further elaborating on the holistic framework designed by Al-Sinan and Bubshait [2].

3. Theory

3.1. Explanation of Section Structure

The theoretical framework used to analyze the experiment in the AMA draws on transition management literature. This field of research is characterized as a deliberative process aimed at influencing governance activities to accelerate change toward societal ambitions [18]. This perspective emphasizes urgency and societal engagement, underscoring the need for active involvement in practical contexts where actors are navigating transitions [19]. Transition management has been particularly applied to sustainability practices. Achieving sustainability requires extensive changes throughout the entire production-consumption chain, including material flows, multi-level structures, institutions, and—crucially—the behavior of actors from resource extraction to final consumption [20]. This explains why, particularly over the last 20 years, sustainability scholars have paid increasing attention to the governance of transitions [21].

The CP experiment in the AMA was designed as a transition process, facilitated by intermediaries who can help drive innovative practices [14,15]. The initial hypothesis was that collaboration among the 48 procurers could generate greater power to substantially impact the markets for circular products and services. The analysis explores the outcomes of this collective experiment, examining whether the procurers were able to encourage the supply of more impactful and innovative products and services. It also identifies the barriers encountered in achieving these ambitious goals.

To develop an analytical framework, this theory section first defines circular procurement as it is applied in this study. Next, it explains the methodology used to measure the experiment's qualitative impact in terms of scope. Finally, it presents a literature overview of potential barriers, comparing these in the next section with the main obstacles encountered in the AMA experiment and reframing them in terms of key enablers and preconditions.

3.2. Defining Circular Procurement

When defining circular procurement, various authors reference the description provided by the European Commission. The European Commission defines circular procurement as "the process by which public authorities purchase works, goods, or services that seek to contribute to closed energy and material loops within supply chains while minimizing, and in the best case avoiding, negative environmental impacts and waste creation across their whole lifecycle" [22]. Some scholars question the exclusive focus on public authorities and advocate for recognizing the role of private organizations and institutions [1,9,10]. Although tender procedures may differ, the procurement activities and preconditions for successful implementation within organizations are quite similar. This is particularly true for service-oriented companies, where procurement mainly relates to facility management and resembles the product categories of public procurement [23]. For industrial organizations, facility management is only a part of their procurement policies; their procurement's role in enhancing circularity within their own supply chains or another sector's supply chain is much closer to their core business and therefore usually more impactful [1]. When industrial companies initiate such circular supply chain initiatives, they must collaborate across different firms' supply chains [1,10,24]. No company can realize such initiatives alone [9]. Therefore, CP should not be viewed solely from a technical

perspective but must also include the necessity of collaboration among procurers and within supply chains [1].

The need for cooperation in supply chains is not addressed in the European Commission's definition. Van Oppen et al. [16] recognized this omission and proposed the following definition: "Circular procurement is the process in which a product, service, or project is purchased according to the principles of a circular economy. In this process, the technical aspects of the product are as circular as possible, taking maintenance and return policies at the end of the use period into account, as well as including financial incentives to guarantee circular use. To encourage circular use, it is also important to agree upon conditions of use, as well as the application and remanufacturing of products or components during and after their first technical lifecycle. This has consequences for how the procurement process is organized and the roles of the procurement officer, internal departments, suppliers, and the entire value chain" [25]. This definition has been applied in the case study presented below.

The definition by Van Oppen et al. [25] suggests that CP involves collaboration with designers and developers to create materials that can be reused, repaired, and remanufactured for multiple cycles. It also necessitates the development of strategic supplier relationships capable of providing and managing these material chains over time [26]. Furthermore, it encompasses a shift in the procurement process, moving from product-selling business models to a more service-oriented system that offers product/service combinations designed to enhance resource utilization efficiency through recovery [27]. According to several authors, this focus distinguishes it from earlier concepts such as sustainable procurement (SP) and green procurement (GP) [1,7,9]. While SP has a broader scope, encompassing the economic and social dimensions of sustainability in addition to the environmental dimension [6], both SP and GP primarily consider environmental benefits in terms of reducing environmental impacts without taking circularity into account. CP targets the highest possible steps on the R-ladder of circularity. In order of priority, these steps are refuse, reduce, redesign, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recovery of energy [13]. Furthermore, SP and GP are more product- and technology-oriented [6], while CP aims to incorporate complex networks and ecosystems [7]. Since the circular economy aims to retain the value of products, materials, and resources within the economy for as long as possible [28], new business models are integral to the circular economy approach [29–31]. Kristensen et al. [8] highlight three additional key differences between CP and GP/SP: First, CP transforms procurement procedures by introducing earlier market engagement, innovative contract forms, and updated tender documents, including technical specifications and award criteria. Second, successful CP strategies require a broader scope of collaboration, both internally and externally, compared to the practices typically associated with GP and SP. Third, CP involves a shift from procuring products to procuring services and solutions, which can facilitate the adoption of circular principles. In the latter case, the procurer must adopt new business models that support circularity, including product-service systems, leasing concepts, shared use, pay-per-use models, and buy-and-sell-back options.

These three distinctions necessitate a shift in mindset, the implementation of new performance measurement systems, the development of new skills and competencies, the cultivation of a positive learning environment, and the allocation of additional financial and human resources [8,26]. Since the implementation of CP requires a major overhaul in the supply and procurement functions, procurement departments are tasked with more extensive responsibilities compared to those involved in SP and GP strategies [1]. Due to this interlinkage between supply and demand, CP is expected to help practitioners, policymakers, and decision-makers achieve Sustainable Development Goal (SDG) number 12, "Responsible Consumption and Production" [1].

3.3. Scope of Circular Procurement

Due to the broad scope of CP, various scholars have sought to reduce its complexity by categorizing its key characteristics. Based on their research, the following four categories can be identified:

First, four different focal areas are distinguished [8]:

- Procurement of improved products and services by adding circular criteria for products and services, such as recyclability, reuse of materials, and use of recycled materials.
- Procurement of services and new business concepts;
- Procurement of new and innovative products, services, and materials promoting circular economy-based business;
- Procurement promoting industrial symbiosis and circular ecosystems, which requires significant investments, as well as cooperation and commitments from various stakeholders to support closed-loop systems.

Secondly, a distinction is made in the contractual methods [1,8]. Does the contract involve traditional procurement, where the purchaser obtains ownership of the product ("product ownership"), or does it involve "retained ownership" (e.g., operational leasing, renting, or selling results instead of goods) to ensure the return of the product after each cycle [32] and extend the product's service life [33] through adopting new business models?

Thirdly, the authors differentiate procurers based on their level of ambition, ranging from a focus on integrating circularity into existing procurement processes to leveraging their purchasing power to transform supply chains or even entire ecosystems toward circularity. Adding circularity to GP criteria does not require a new mindset, while transforming supply chains or eco-industrial parks demands an innovative approach, where the procurer collaborates and builds strategic alliances with supply chain partners [6,7,25].

Finally, the various levels at which CP activities can occur constitute an important category. Based on the literature, three main levels can be distinguished from the perspective of both public and private procurers [1]:

1. Micro-level—focusing on the procurer's internal organization. This includes strategic aspects (strategy formulation, top management awareness, and commitment, including finance) and executional practices (buying power, company procurement processes, skills and knowledge, operational tools, internal coordination, and organizational culture) [5,12,22].
2. Meso-level—dealing with factors related to the entities with which and how the procurer interacts in the supply chain or eco-industrial parks [1]. This may involve consulting the market, collaborating with top-performing actors in the market, working with market actors on innovative, circular solutions, or actively participating in transforming the supply chain or eco-industrial park.
3. Macro-level—encompassing various types of political support, such as legislation, procurement specifications, or financial incentives, along with social obligations rooted in moral legitimacy and cultural-cognitive expectations of stakeholders [12].

Figure 2 summarizes the scope of CP, encompassing the four categories discussed above. This table will serve as the primary framework for analyzing the case of the AMA.

3.4. Barriers and Enablers

Since 2018, barriers and enablers related to the implementation of CP have received increasing attention in the literature. Qazi and Appolloni [1] were among the first researchers to conduct a comprehensive investigation into these barriers and enablers. They expanded their focus beyond the dominant perspective of the focal firm, adopting a supply chain approach and categorizing the barriers and enablers into three levels, comparable to the three levels mentioned above. They compiled an extensive list of 55 barriers and 55 enablers. The barriers are grouped into 10 themes, summarized as follows (see Figure 3):

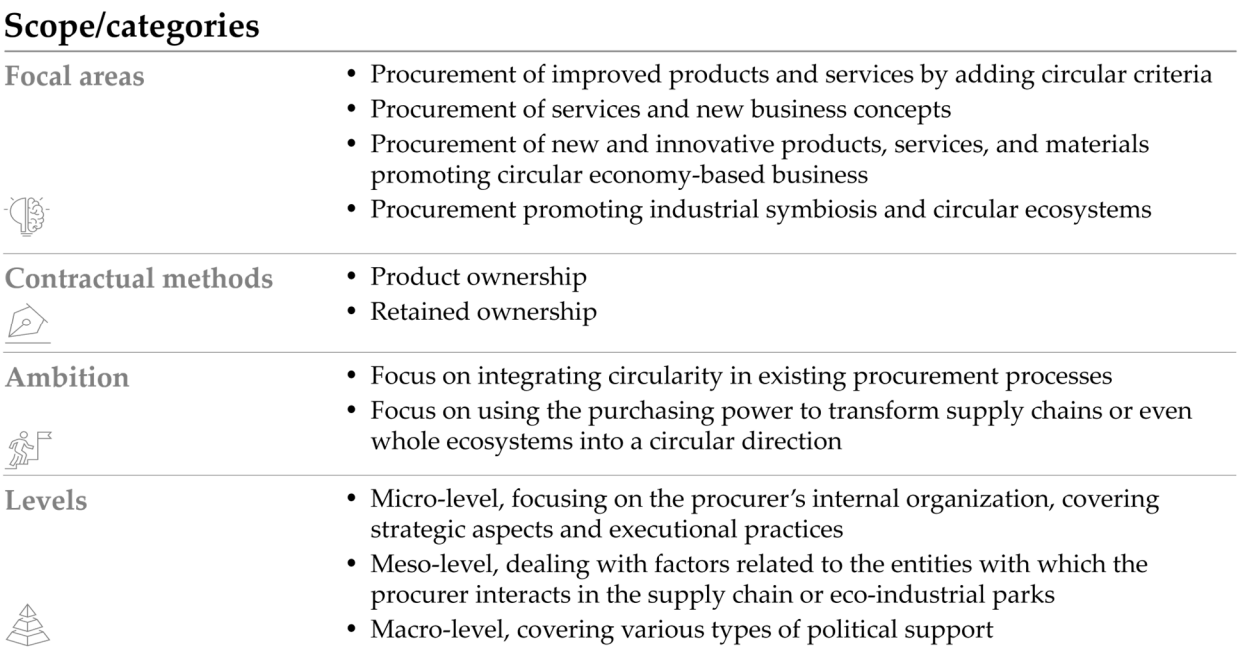


Figure 2. Scope of CP.

1. Lack of a coordinated sourcing strategy
2. Complexity in material specifications and requirements
3. Insufficient coordination in material need identification within the organization
4. Absence of a reverse logistic system
5. Resource constraints
6. Deficiency in skills, knowledge, and expertise
7. Lack of prioritization by top management
8. Resistance to change within the organizational culture
9. Lack of alignment among stakeholders
10. An unreceptive external environment

Figure 3. A total of 10 themes summarizing the 55 barriers to implementing CP.

The first eight themes are critical at the micro-level of the individual organization, theme nine pertains to challenges in engaging stakeholders in the supply chain at the meso level, and theme ten operates at the macro-level. The list of enablers can be framed as the inverse of these barriers. When one or more barriers are removed, they can transform into enablers. For example, when top management is committed to CP and the organizational culture is supportive, this facilitates the adoption of CP. In the analysis presented here, the ten themes outlined in Figure 3 will serve as a reference.

Other studies, such as Al-Sinan and Bubshait [2], produce similar lists of antecedents, although they are often organized in slightly different ways. To further explore which of

these barriers is more significant, Kristensen et al. [8] analyzed the transition from green to circular public procurement in eight proactive Danish municipalities. Initially, a key barrier was found to be the lack of competencies within procurement departments. As a result, their understanding of CP was limited to a few well-established cases, such as issues related to packaging and suppliers' takebacks of products like toner cartridges. The new pilot projects (textiles, furniture, IT equipment, and playgrounds) in which a few municipalities were involved incorporated only elements of the circular economy rather than developing solutions from a fully circular foundation [8].

Ntsondé and Aggeri [7] conducted one of the few other empirical studies on the key constraints in implementing CP. They analyzed an initiative by the city of Aalborg in Denmark, involving 54 schools in the CP of furniture. The municipality was able to create space for innovative design and exploration within a specific tender for new circular furniture. However, despite the positive outcome of the school furniture bid, the sustainability department has struggled to convince the procurement department to replicate this experimentation in other markets. The key barriers were time, funding, and consistent provision of space for experimentation by the municipality. Based on this experiment, Ntsondé and Aggeri [7] conclude that many constraints cannot be easily systematized on a regular basis. More experiments are needed to generate new knowledge on whether and how the constraints that hinder the materialization of CP's potential impact in practice can be overcome. This paper aims to contribute to filling this knowledge gap.

Based on a longitudinal, in-depth analysis, this paper analyzes how and under what conditions a significant market transformation toward a circular economy can be achieved through a coordinated CP initiative in the AMA. The study examines the outcomes achieved over a nine-year period by analyzing:

- The scope of CP adopted by the participating partners (with reference to Figure 2);
- The preconditions and key enablers essential for realizing the substantial impact of CP (with reference to Figure 3);
- An implementation approach for practitioners, derived from this analysis.

4. Results

4.1. Research Design and Execution

The primary objective of the CP experiment in the AMA was to maximize the impact of transitioning product chains from linear to circular through collaborative efforts. The premise was that a joint effort by procurers would increase producers' willingness to introduce more circular products and services to the market. By coordinating substantial demand, the initiative aimed to provide producers with greater certainty regarding returns on investment and foster a level playing field.

The research design comprised six activities, each representing a subsequent methodological stage.

Activity 1 involved securing support from organizations within the AMA to participate in the collective CP initiative. Interested participants included businesses, educational institutions, and local governments.

Activity 2 focused on acquiring knowledge about the concept of CP and how to implement it within each organization.

Activity 3 synthesized the insights gained in Activity 2 and identified key enablers and preconditions necessary to execute a collective CP initiative. This reflective pause led to the development of two follow-up activities, Activities 4 and 5, which aimed to transition from adding circular criteria to individual procurement processes to establishing ambitious, collective initiatives stimulating circular economy-based business practices.

Activity 4 sought to expand and innovate the market for circular products and services by creating a standardized CP approach with shared contract requirements.

Activity 5 implemented a collective CP strategy across three specific product chains, targeting the procurement of new and innovative products, services, and materials that promote circular economy-based business practices.

Activity 6 was intended to consolidate and embed the CP program within participating organizations.

The following analysis will examine the evolution of the CP experiment based on the six activities outlined above.

4.2. Evolution of the Circular Procurement Experiment in the Amsterdam Metropolitan Area

4.2.1. Activity 1: Preparing the Circular Procurement Experiment (2015–2016)

The CP experiment was one of two strategies within a broader circular economy initiative in the AMA, with the other strategy focused on closing the loop for nine priority waste streams [13]. The experiment was initiated by the AMEC, which acted as an intermediary "transition broker" [15]. AMEC successfully garnered broad support for the CP experiment. Local governments were motivated to become leaders in the shift toward a circular economy, which is a key national policy objective, and viewed CP as a central driving force in this transition. Additionally, they were already familiar with SP and could rely on technical assistance from the national expertise center for SP (PIANOo), part of the Netherlands Enterprise Agency (RVO), an executive agency of the Dutch government. Other AMEC partners (businesses and educational organizations) also agreed to participate, recognizing CP as a valuable tool for creating a market for circular products and services and demonstrating their contributions to the circular economy. In sum, the CP program was well-received.

4.2.2. Activity 2: Building Knowledge and Competencies (2016–2019)

At the request of AMEC network partners, the CP experiment began with a focus on building knowledge and competencies. They considered knowledge acquisition as a precondition for successful implementation. Between 2016 and 2019, AMEC established three communities of practice, each consisting of six sessions and involving a total of 31 representatives from procurement or sustainability divisions across AMEC's network partners. An AMEC board member (the author of this paper) moderated these communities sequentially as a transition broker [15], assisted by the board's challenge lead for the circular economy. The primary goals were to acquire knowledge about CP and facilitate the exchange of experiences among participants about procurement initiatives, carried out within the organizations involved. The focus was primarily on the participating organizations themselves (the "micro-level").

The book *Circular Procurement in 8 Steps* [25] served as a significant source of inspiration for addressing the multifaceted aspects of this endeavor. In addition to discussing the book and sharing experiences with CP, participants committed to implementing CP within their own organizations. They had the autonomy to determine which CP projects and contractors were selected [13] and were responsible for gaining support from key actors within their respective organizations.

The scope of the CP initiatives (see Figure 2) primarily focused on the following areas: procuring improved products and services by adding circular criteria and procuring services and new business concepts. Their main ambition was to integrate circularity into existing procurement processes. Both contractual methods (product and retained ownership) were applied. Most CP initiatives were directed at higher levels within the R-ladder of circularity. Product redesign and reuse received the most attention, followed by the concept of refusal. However, the procurers were generally reluctant to take significant risks and therefore focused on proven solutions.

New business models, such as leasing instead of selling and sharing costs and benefits among chain partners, were occasionally adopted. These models were particularly embraced in cases where their success had been demonstrated, such as leasing office furniture or using secondhand options and adopting circular approaches in the building sector. The five product categories most frequently selected were demolition/construction, office furniture, traffic signs, catering, and IT business equipment. On rare occasions, purchasing departments served as the launching customer for innovative products that had not yet

been proven in the market [34]. An example of this is a newly constructed circular meeting place and restaurant, where experimentation and knowledge sharing were primary objectives. In this instance, the purchasing department received management support to invite startups, such as those cultivating mushrooms from coffee grounds or creating products from orange peels [35].

4.2.3. Activity 3: Reflective Pause (Late 2019–2020)

After completing the three communities of practice, AMEC invited participants to take a reflective pause and collectively evaluate the CP experiment thus far. The participants acknowledged that they had acquired substantial knowledge and competencies related to the meaning and implementation of CP, as well as how to develop new business models. They also valued their newfound understanding of how to effectively organize market consultations through a competitive dialogue procedure [36]. Moreover, they emphasized the paramount importance of trustworthy collaboration between procurers and potential suppliers from the early stages of the tender process. Additionally, they appreciated the opportunity to exchange experiences on CP with other organizations participating in these communities. Finally, they recognized the added value of the mobilizing power provided by AMEC as the program's organizer and session moderator [37].

- The participants identified the shift in mindset within their organizations as the most challenging aspect, viz.;
- Transitioning from procurement solely managed by procurement officers to a model owned by multiple departments;
- Shifting from one-time transactions to long-term relationships between buyers and suppliers.

To create this shift in mindset, the participants prioritized the following key enablers [37]:

1. Internal resources (time, personnel, and money);
2. Commitment of key actors, viz. CEOs/directors and middle management;
3. Accountable targets;
4. Adaptation of accountancy rules;
5. Successful showcases

The participants acknowledged their lack of capabilities to establish entirely new circular product chains. They argued that a dedicated team of independent intermediaries, such as AMEC, was needed to coordinate circular initiatives at the supply chain level and across procurers participating in such initiatives. However, they saw possibilities to generate a higher impact by creating markets for circular products and services through a joint effort at a regional level [37].

At a follow-up meeting in January 2020, the participants expressed a strong desire to continue. They proposed focusing on two main activities:

Activity 4: Establishing a coordinated CP execution plan to collectively develop a market for circular products and services.

Activity 5: Creating innovative alliances within specific product chains to transform these chains more fundamentally.

AMEC agreed to coordinate these two follow-up activities. Activity 4 was conducted in collaboration with the regional board of local governments (MRA), which has assisted AMEC since 2018. AMEC assumed a coordinating role among business partners and educational institutions, while MRA coordinated among local governments. Both follow-up activities are described below.

4.2.4. Activity 4: Establishing a Coordinated Circular Procurement Execution Plan (2020–2022)

This activity focused on establishing a coordinated CP execution plan. The aim was to collectively create a market for circular products and services by developing a standardized

CP approach with shared contract requirements. To formulate and execute this plan, the MRA and AMEC followed parallel strategies and engaged in a fruitful exchange of knowledge and experience.

The MRA established a dedicated public CP working group at the request of the representatives of local governments who participated in the first community of practice [38]. With a purchasing power of €4 billion per year, the MRA participants expected to play a key role in stimulating more circular products and services. The working group aimed to involve all municipalities and the two provinces in the region and secure political commitment for their efforts [39].

The group's first achievement was a collective political endorsement on 22 June 2018, to reach 10% CP by 2022, 50% by 2025, and 100% as soon as feasible. These percentages refer to the volume or value of circular purchasing relative to total procurement. The data are derived from market consultations or contract requirements. To meet these targets, the MRA developed a road map in 2019, which serves as a practical manual to achieve CP ambitions and integrate CP within organizations. The working group decided to focus on the five CP trajectories prioritized during the first community of practice (demolition/construction, office furniture, signposting, catering, and IT business equipment) and implement two or three of these by late 2018. Additionally, a help desk was established to provide advice.

In 2022, the objective of 10% CP was met. A total of 19 of the 27 MRA local governments that signed the political endorsement achieved an average CP percentage of 37%. The other eight MRA participants were unable to meet the target due to a lack of staff. The alderman of Haarlem, who led the initiative, responded with understanding: "It is not easy for municipalities to achieve this objective. The added value of MRA cooperation is to help each other and work together towards the 50% objective". He added: "We can scale up by sharing knowledge about CP: how do you do that at the local level? Ultimately, to become 100% circular, one needs to address the entire chain, from production to consumption. That quickly exceeds the local and MRA level" [40]. The activities continued over the last two years, and the next monitoring report will be issued in due time.

In line with the MRA, the AMEC board requested businesses and educational institutes affiliated with the board to adopt similar objectives to the MRA. However, their response was reluctant because they either had their own targets in place or were hesitant to establish such targets. Similarly, the MRA's road map on CP was not considered appropriate for them. To develop their own execution plan, the board arranged informal conversations with those already involved. Support was garnered for a joint initiative focused on the CP of several key product groups related to facility management, such as food, cleaning, workwear, office waste streams, buildings, IT, and solar panels. These product groups were considered relevant for all participants [41]. At the participants' request, the program was rebranded as "Procurement with Impact" because it was preferred to integrate circularity into existing CP procedures. Two AMEC staff members drafted the guidelines in collaboration with representatives from companies and educational institutes involved. These guidelines were derived from the database of the national expertise center for SP, PIANOo [42]. A consultancy firm helped develop a simple reporting system to track progress. This monitoring tool was applied once, with a response rate of 25 organizations. They reported their CP activities but mentioned few circular initiatives. Those reporting the progress, who were not the same individuals involved in the communities of practice, considered "circularity too complex and therefore a bridge too far" [43]. Similarly, an attempt by the AMEC board to include personnel diversity was unsuccessful. After these attempts, implementation stagnated due to a lack of willingness from the participating organizations.

To overcome this hurdle, the AMEC board member leading the program made a strong plea at a board meeting on 20 September 2020, to consider CP "Chefsache" ("Matter of the Boss"). All 18 board members representing businesses and educational organizations were requested to secure active commitment from themselves and their middle management. This echoed a plea made earlier by the participants of the communities of practice, who argued that as long as other departments in the organization do not fully cooperate, CP

is doomed to fail [37]. Although all board members and also the other companies and educational institutes involved in the communities of practice responded positively, the decision ultimately did not materialize. The execution of this decision was delegated to two AMEC staff members, who did not have enough time in addition to regular work to follow through [43]. The board member leading the CP program stepped down in October 2022 and could not proceed further. In 2024, AMEC revised its strategic priorities and ended the Procurement with Impact program [41].

Altogether, 48 public and private organizations actively participated in the CP program since its inception. Representatives from local governments, coordinated by the MRA, were able to develop a joint execution plan and establish common targets. Although eight municipalities could not meet the targets due to a lack of staff, progress has been made. However, representatives from businesses and educational institutions were reluctant to align their procurement activities, opting instead to follow their own internal strategies. Furthermore, AMEC staff members were unable to dedicate sufficient time to overcoming this challenge. As a result, AMEC's efforts to establish a coordinated CP execution plan, as initially intended, were unsuccessful.

4.2.5. Activity 5: Forming Innovative Alliances Within Three Product Chains (2020–2021)

In Activity 4, AMEC initiated the formation of innovative alliances within specific product chains. The goal was to achieve more fundamental transformations toward circular products and services. In 2020, a collaborative effort was established among procurement departments, focusing on three significant product categories: IT office equipment, servers for data storage, and solar panels. First, AMEC, in collaboration with the Utrecht Sustainability Institute, conducted three circular economy labs involving willing stakeholders from the supply chain and contracting parties. These labs focused on IT office equipment (29 September 2020), data servers (1 December 2020), and circular solar panels (28 June 2021). The primary aim was to identify substantial innovative circular initiatives that could be collectively undertaken and to outline the procurement requirements to be established by the contracting parties.

The IT labs were spearheaded by two AMEC challenge leads (circular economy and IT) in collaboration with the AMEC board member coordinating the CP program. The IT challenge lead had previously established a large regional program called Lower Energy Acceleration Program (LEAP) to accelerate the transition to a sustainable digital infrastructure. This program was aligned with the innovative CP initiative. Both IT labs resulted in clear steps forward, detailing which innovative measures could be implemented and how these could be integrated into procurement requirements with three ambition levels [44,45]. Subsequently, the organizations involved began conducting procurement pilots. However, the participants observed that the impact of these pilots remained relatively small unless other enablers were also in place. Some of these enablers, such as the consistent implementation of procurement standards, could be realized by the partners involved. However, scaling up and ultimately mainstreaming the pilots required regulatory, economic, financial, and/or social incentives. Such changes could only be achieved with the active support of the national government. Consequently, AMEC approached the Dutch government in 2022 to help scale up the LEAP program to the national level. This led to the launch of the action plan for sustainable digitalization, which prioritized making the digital sector itself, the equipment of end users, and the IT of the national government more sustainable and circular. The selection of these themes was a direct result of AMEC's work. After establishing this national platform, the IT challenge lead at AMEC moved on to a new job and stepped back from the initiative. Since the implementation of the action plan is still in its early stages, its impact on transforming the IT product chain cannot yet be fully assessed, though it appears promising.

The solar panels lab focused on the state of the art in the production of circular solar panels and the recycling and reuse possibilities of discarded panels. Lab participants presented examples of innovative circular solutions and discussed the enablers for scaling

up [46]. These included launching customers, procurement requirements, innovation funds, and standards for the quality of circular products and services. Subsequently, AMEC invited its network partners to jointly act as launching customers for the most circular solar panels produced in the Netherlands. However, only a few municipalities, including Amsterdam, signed up, while others cited various reasons for not participating. To scale up these activities, AMEC contacted the Fair Solar Network, a national initiative launched in 2021 by the province of South Holland. Its objective is to promote high-value recycling and reuse of discarded solar panels and the development of new circular solar panels. The network is also connected to a large innovation program called SolarNL, with a budget of €412 million, aiming for large-scale production of circular solar cells and panels. Although this solar panel initiative at a coordinated national level has just begun, the outlook is promising. While AMEC trusted others to lead the Fair Solar Network, it maintained close contact. AMEC, together with MRA, remained involved in a regional initiative focused on establishing a recycling facility and promoting the reuse of solar panels through an online platform for the demand and supply of secondhand solar systems, called ZonNext. These activities are ongoing.

4.2.6. Activity 6: Consolidating the Program (2023–Ongoing)

AMEC's role in coordinating the CP experiment concluded in 2024. Most tasks related to Activity 4 were delegated to participants representing businesses and educational institutions, who continued to implement CP initiatives at their own pace, occasionally incorporating circularity. Activity 5 was transferred to other leaders overseeing the two national IT and solar panel networks. Encouraged by the board and the newly appointed director, AMEC has shifted its strategic priorities to other challenges.

The MRA remains committed to advancing Activity 4; however, progress has been somewhat slower than anticipated. At the political level, overall objectives for CP have been formulated, but "the translation into concrete, accountable goals for each local government (split into goals for each involved department) is absent. This lack of political guidance hampers the energetic implementation of CP and broad support within the MRA's organizations. Additionally, changes in personnel within the organizations were not helpful either" [47].

4.2.7. Summary of the Results

The following results are summarized, focusing on three primary activities undertaken at various levels:

Micro-level: Developing knowledge and competencies within the individual organizations involved (Activity 2).

Micro- and meso-level: Establishing a coordinated CP plan to collectively create a market for circular products and services (Activity 4).

Meso- and macro-level: Forming innovative alliances within three product chains to fundamentally transform these chains (Activity 5).

For each activity, the scope and barriers are summarized, as illustrated in Figures 2 and 3. The barriers are reframed as preconditions and key enablers essential for achieving substantial impact in CP.

The scope of Activity 2 primarily includes the procurement of improved products and services by adding circular criteria and occasionally on new business models through contractual methods, such as retained ownership. These initiatives are often aimed at higher levels on the circularity R-ladder. However, their ambition was modest, concentrating on proven solutions. On rare occasions, purchasing departments served as the launching customer for innovative products that had not yet been proven in the market.

Currently, the scope of Activity 4 is similar to that of Activity 2. However, more innovative initiatives may be pursued in the future, especially if increased collective ambition leads to joint procurement of new and innovative products, services, and materials that promote circular economy-based business practices.

The scope of Activity 5 surpasses that of Activities 2 and 4, as it was designed from the outset to fundamentally transform specific supply chains toward a circular model by leveraging the purchasing power of committed procurers. Consequently, the focus is on the procurement of new and innovative products, services, and materials that promote circular economy-based business models, alongside new business concepts, including product ownership and retained ownership. Activity 5 moves beyond the micro-level of individual purchasing organizations and focuses on the meso-level within the AMA and the macro-level nationally. Whether the ambition will be diluted during national-level negotiations remains to be seen.

During the execution of the experiment in the AMA, the barriers to achieving impactful results were reflected upon together with the participants involved. This resulted in a list of general preconditions and enablers at the micro-, meso-, and macro-levels to create fertile ground for the successful implementation of CP. Figure 4 summarizes the general preconditions relevant at all three levels and the key enablers that stood out as being most prominent in creating circular economy-based businesses.

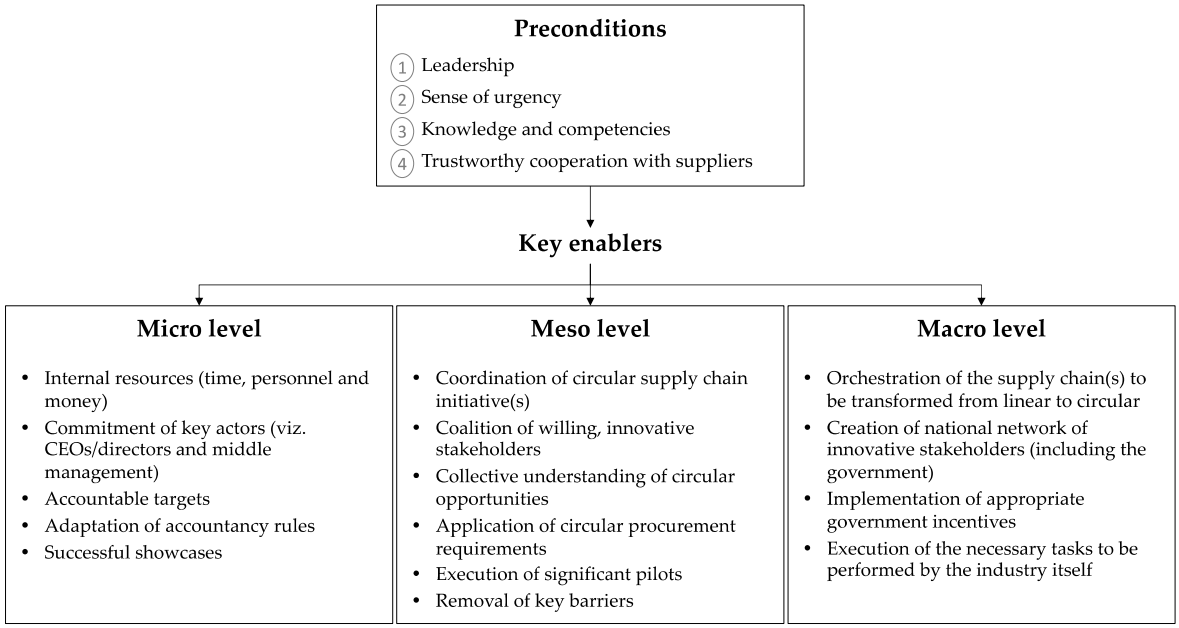


Figure 4. General preconditions and key enablers at micro, meso- and macro-level.

5. Discussion

Discrepancies in the literature persist regarding the potential impact of CP on innovation and markets, primarily due to the challenges procurers face in supporting innovation practices within the private sector. The extent to which procurers can push these boundaries remains underexplored in the literature [7]. This paper addresses this knowledge gap. Drawing on CP literature [1,10], this study hypothesizes that knowledge sharing and collaboration among procurers can positively influence markets for circular products and services. Accordingly, the paper evaluates a coordinated CP experiment aimed at driving significant market transformation toward a circular economy. The experiment was conducted in the AMA from 2015 to 2024, involving 48 public and private procurement departments and their organizations. The CP experiment was designed as a transition process, facilitated by intermediaries who can help drive innovative practices [14,15]. The qualitative, empirical data obtained through this process-oriented approach provided insights into the scope and barriers of the activities undertaken. The following questions are addressed below:

What is the theoretical contribution of this study? Which further research directions can address the remaining research gaps? Which practical guide can be provided for implementing CP based on the results of this study?

The theoretical contribution to the literature is multifaceted. The extensive data generated offers a deeper understanding of the potential collective impact that the involved procurers could make to enhance innovation and expand markets for circular products and services. The analysis reveals the limitations of achieving significant impact by individual procurers at the micro-level, as well as the potential to fundamentally transform product chains at the meso-level (supply chain) and the macro-level (national) through a collective approach. Although previous quantitative studies have examined the positive effects of collaboration on sustainability performance, their focus has been on firms within supply chains rather than on collaboration among procurers [1,10].

Additionally, very few in-depth empirical analyses on the implementation of CP have been published (e.g., [7,8]). None of these studies covers a nine-year period or addresses all three levels: the micro-level of individual organizations, the meso-level (supply chain), and the macro-level (national). The few empirical studies conducted, primarily at the micro-level [7,8], have reached conclusions similar to those in this paper. The experiment in the AMA provides additional insights due to its multi-level approach and the extended collaboration with participating procurers over a long period. The primary new findings include a systematic overview of the scope of CP, as well as the preconditions and enablers at the micro-, meso-, and macro-levels necessary to foster innovation and markets for circular products and services (refer to Figure 4).

Comparing our results with several in-depth reviews of the many barriers encountered in implementing CP (e.g., [1,2]) reveals that only a limited number of barriers are key to accelerating the CP process. Once these are addressed, the many other barriers mentioned in the literature can be more easily overcome. This prioritization of barriers prevents procurers from feeling overwhelmed by the numerous challenges they face, making them less hesitant to act. The lists of barriers to implementing CP identified by various authors mainly focus on internal barriers at the micro-level. This paper also addresses barriers at the meso- and macro-levels, although more research is needed for a complete picture. The enablers at all three levels, which could be derived from the barriers encountered, should be seen as dynamically interacting elements that evolve over time.

CP is considered more complex than SP [8]. This complexity may be evident at the micro-level. However, similar barriers to scaling up and fundamentally transforming product chains at the meso- and macro-levels are expected to arise in CP as well. Both CP and SP require system innovation, involving institutional, organizational, economic/financial, legal, technical, and behavioral changes.

Finally, the added value of this study lies in its detailed description of the transition process toward CP. This approach not only highlights physical behaviors but also interprets them within their broader context as understood by the participants. The core insights from this comprehensive description are presented in a narrative format below.

The first stage of the transition process in the AMA was to build knowledge and experiences within the individual organizations. This objective has been met. However, knowledge distribution within their organizations, which could have fostered broader support for CP, received little attention. As a result, key actors—specifically CEOs, directors, and middle management—had not yet demonstrated strong commitment. Furthermore, participants lacked the capabilities needed to establish entirely new circular product chains, arguing that this would require joint efforts with other procurers. Individual procurers, typically feeling unable to influence innovation practices in the private sector, tend to focus on proven solutions. Only occasionally, purchasing departments acted as the launching customer. These findings are consistent with conclusions drawn by other scholars [7,8].

To increase the influence on innovation and markets for circular products and services, a coordinated CP execution plan was established. The assumption was that a joint effort would send a clearer signal to the market, prompting the production of more circular

products and services. To create this market, shared objectives and procurement requirements, including a monitoring system, needed to be agreed upon and implemented within the procurers' organizations involved. This turned out to be a significant challenge. The most successful efforts were coordinated by the MRA at the local government level. These governments were able to agree on a common approach and achieved first results. Their main challenges included a lack of clear, accountable goals for each local government (with goals broken down for each involved department) and insufficient resources in smaller municipalities to meet the established targets. Additionally, continuous personnel changes within the organizations and political administrations further impeded progress. Businesses and educational institutions coordinated by AMEC showed less motivation to align their procurement strategies with one another. Each had its own strategy and preferences, which were more dominant than the ambition to collectively create a market for circular products and services. More dedicated time and manpower to coordinate the initiative might have mitigated the reluctance of businesses and educational institutions. However, as long as the need for cooperation in CP is not widely recognized, successful outcomes cannot be expected. Since local governments are accustomed to collaborating within the MRA on policy issues and have prioritized the circular economy, the likelihood of their collective efforts becoming impactful is greater.

Parallel to the above collective effort, three product chain initiatives were taken: IT office equipment, data servers, and circular solar panels. The aim was to create innovative alliances to transform these chains more fundamentally. Although pilots were initiated at urban scale, it soon became clear that upscaling would require the involvement of the national government and a broader group of stakeholders. Thus, at the urban scale (meso-level), large pilots can be set up through a joint initiative of a group of willing procurers or by one or a few very powerful large procurers in collaboration with supply chain actors. Scaling up to the national level and mainstreaming the circular initiative requires a different kind of action, which transcends the realm of what procurers at an urban level can address.

The experiment conducted in the AMA demonstrates that the success of a long-term journey in CP hinges on effective leadership over an extended period. As long as CP principles are not structurally embedded in the strategy and execution of individual organizations, the coordinating efforts of an independent intermediary organization—also referred to as a transition broker [15]—seem crucial. However, even when a transition broker is appointed, as was the case with AMEC, success is not guaranteed. Additionally, a sense of urgency to transform the market from linear to circular, along with sufficient knowledge, competencies, and trustworthy cooperation with suppliers, are important preconditions. These preconditions also apply to initiatives aimed at fundamentally transforming product chains in terms of circularity. The latter findings underscore the need for collective action from committed stakeholders at regional and national levels who recognize the importance of transforming entire product chains in collaboration with supply chain actors. Without broad cooperation among network partners and strong leadership of national government, initiatives are likely to remain fragmented and limited in impact. Patience and endurance are required to achieve impactful results at the micro-, meso-, and macro-level.

The paper also offers insights for practitioners. Based on the findings regarding the evolution, scope, preconditions, and enablers to implementing CP at the micro-, meso-, and macro-levels, a structured, practical guide for implementing CP is provided in Figure 5. This guide translates the holistic theoretical framework designed by Al-Sinan and Bubshait [2] into a simple tool for practitioners. It should be noted that the four phases mentioned in Figure 5 can be executed in parallel, particularly phases 2 and 3.

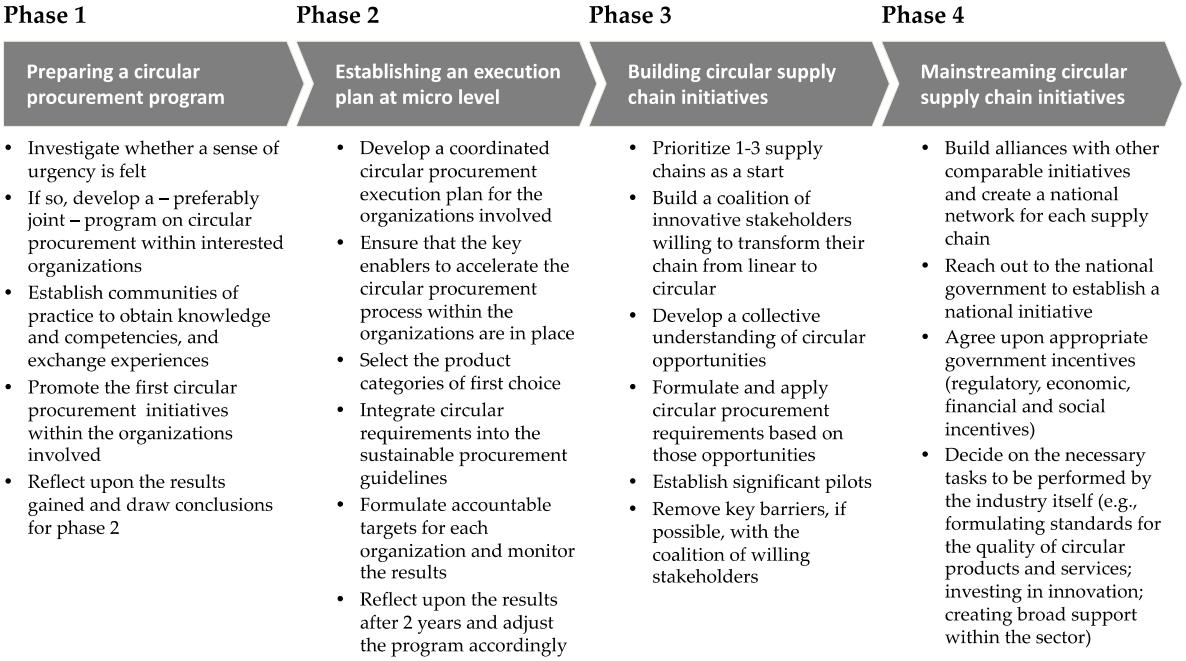


Figure 5. Structured, practical guide to implementing CP.

This paper has identified theoretical gaps that were not fully addressed and require further research, particularly concerning the limited understanding of how procurers and supply chain actors can collaborate to fundamentally shift the market toward circular products and services at the meso- and macro-levels. Real-life case studies addressing this challenge would provide valuable insights into the dynamics among actors with diverse interests. Examined through the lens of transition management, the complexities of these new forms of collaboration can be further illuminated.

Additionally, while the distinction between CP and SP is emphasized in the literature, it remains primarily conceptual. Whether this distinction is as clear-cut in practice warrants further investigation. This study indicates that the impact of CP on innovation and market development becomes significant when procurers coordinate their efforts in collaboration with suppliers and supply chains at the meso- and macro-levels. The complexities of this transition process may also be relevant for CP.

Finally, additional research is needed on the role of intermediaries ("transition brokers") and other actors in taking leadership to advance CP. This study reveals that, without leadership, collective efforts are likely to fail.

6. Conclusions

This paper hypothesizes that knowledge sharing and collaboration among procurers can positively impact markets for circular products and services. To test this hypothesis, the paper evaluates, including businesses, educational institutions, and local governments.

The CP experiment in the AMA was analyzed as a transition process, facilitated by intermediaries to encourage innovative practices. Throughout the experiment, detailed documentation was collected, including meeting minutes, event records, individual interviews, and sessions from the community of practice. This extensive qualitative data provided valuable insights into the scope of activities and the barriers encountered.

The CP initiative in the AMA consisted of three main activities:

- Building knowledge and competencies within the organizations involved;
- Establishing a coordinated CP execution plan to collectively create a market for circular products and services;
- Forming innovative alliances within three product chains to transform these chains more fundamentally.

The paper presents a novel contribution to its field. Very few in-depth empirical analyses on the implementation of CP have been published, and those that do exist primarily focus on the micro-level of individual producers. None of these studies covers a nine-year period and addresses all three levels: the micro-level of individual organizations, the meso-level (supply chain), and the macro-level (national). The analysis reveals the limitations of achieving significant impact by individual procurers at the micro-level, as well as the potential to fundamentally transform product chains at the meso-level (supply chain) and the macro-level (national) through a collective approach. The primary new findings include a systematic overview of the scope of CP, as well as the preconditions and enablers at the micro-, meso-, and macro-levels necessary to foster innovation and markets for circular products and services. Comparing the results with several in-depth reviews of the many barriers encountered in implementing CP reveals that only a limited number of barriers are key to accelerating the CP process.

CP is considered more complex than SP [8]. This complexity may be evident at the micro-level. However, similar barriers to scaling up and fundamentally transforming product chains at the meso- and macro-levels are expected to arise in CP as well. Finally, the added value of this study lies in its detailed description of the transition process toward CP. This approach not only highlights physical behaviors but also interprets them within their broader context as understood by the participants.

The paper also offers insights for practitioners. Based on the findings regarding the evolution, scope, preconditions, and enablers to implementing CP at the micro-, meso-, and macro-levels, a structured, practical guide for implementing CP is provided.

The study has several limitations. It presents an in-depth analysis of a specific region; however, additional empirical research in diverse political and sociocultural contexts is necessary to verify the findings reported here. Second, the paper could not fully analyze the barriers encountered at the meso- and macro-levels. Addressing this would require a comparable analysis focused on specific supply chains over a longer period. Further investigation is also needed to determine the extent to which the barriers encountered at the micro-, meso-, and macro-levels differ between circular and CP. Finally, the nine-year longitudinal study concludes with an open end, as the process of implementing CP in the AMA is ongoing. Achieving the potential impact described in the literature is a long journey, requiring sustained commitment and leadership to maintain momentum and achieve lasting change in the transition to a circular economy.

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Conflicts of Interest: The author declares no conflict of interest.

Abbreviations

AMA	Amsterdam Metropolitan Area
AMEC	Amsterdam Economic Board (regional triple-helix organization, representing business, educational organizations, and local government)
CP	circular procurement
GDP	gross domestic product
GP	green procurement
LEAP	Lower Energy Acceleration Program
MRA	Metropolitan Region of Amsterdam (regional board of local governments)
OECD	Organization for Economic Co-operation and Development
PIANOo	national expertise center for sustainable procurement
RVO	Netherlands Enterprise Agency
SDG	Sustainable Development Goal
SP	sustainable procurement

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