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Review

Circular Economy Practices and Strategies in Public Sector Organizations: An Integrative Review

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Abstract: The concept of the Circular Economy (CE) is an increasingly attractive approach to tackling current sustainability challenges and facilitating a shift away from the linear "take-make-use-dispose" model of production and consumption. The public sector is a major contributor to the CE transition not only as a policy-maker but also as a significant purchaser, consumer, and user of goods and services. The circularization of the public sector itself, however, has received very little attention in CE research. In order to explore the current state of knowledge on the implementation of CE practices and strategies within Public Sector Organizations (PSOs), this research aims to develop an overview of the existing literature. The literature review was designed combining a systematic search with a complementary purposive sampling. Using organizational sustainability as a theoretical perspective, the main results showed a scattered landscape, indicating that the limited research on CE practices and strategies in PSOs has focused so far on the areas of public procurement, internal operations and processes, and public service delivery. As a result of this literature review, an organizational CE framework of a PSO is proposed providing a holistic view of a PSO as a system with organizational dimensions that are relevant for the examination and analysis of the integration process of CE practices and strategies. This innovative framework aims to help further CE research and practice to move beyond current sustainability efforts, highlighting that public procurement, strategy and management, internal processes and operations, assessment and communication, public service delivery, human resources dimensions, collaboration with other organizations, and various external contexts are important public sector areas where the implementation of CE has the potential to bring sustainability benefits.

Keywords: circular economy; practices; strategies; sustainability; public sector organizations; review; framework

1. Introduction

The concept of Circular Economy (CE) is increasingly receiving attention from companies, academics, and policy-makers as a practical approach to address the current sustainability challenges and transform the linear "take-make-use-dispose" model of production and consumption into a circular model of resource management [1]. In the practical implementation of CE, scholars generally identify three levels of initiatives: the micro level of firms and organizations, the meso-level of networks and the macro level of policy and regulations [2]. At macro level, the first impulses of governmental and policy initiatives to accelerate the CE transition have been taking place at national and international levels [3], with policy engagement at European level emerging from the launch of the European Action

Plan for the CE by the European Commission (EC) in 2014 and by the communication of the CE Package in 2015 [4]. Various governments across the world, such as China, Japan, United Kingdom, France, Finland, and the Netherlands, have introduced the concept of CE in national strategies and policies [5,6], thus orienting the scientific interest on the role of the public sector in the CE transition mainly towards the analysis and proposition of policies at macro level, focusing on the public sector as a regulator of the transition [7].

However, the public sector is not only a regulator and policy-maker but also a major economic actor as a significant purchaser of goods and services. This aspect of the public sector is largely absent from CE research to date. However, in the European Union (EU) the general government expenditure represented 46.7% of GDP in 2018 [8] and countries of the Organization for Economic Cooperation and Development (OECD) spend about 15%–20% of their Gross Domestic Product (GDP) on Public Procurement (PP) [9]. The public sector is also a big employer with more than 55 million employees, corresponding to 25% of the total labor force in the EU [10]. The public sector has thus significant sustainability-related impacts on environmental, social, and economic issues that need managing [11]. It therefore needs to be considered as an active actor in the economic system, one that buys, consumes, manages, and disposes of a substantial amount of resources. One of the other functions of the public sector that has been put forward by authors for the transition towards CE and sustainability is the importance of the public sector as a role model [12] where the public sector must serve as an example of good practice [13,14]. This is because the public sector has influence over all other sectors [15], designing the policies and regulations as well as setting the overarching direction for how organizations are implementing the idea of CE in practice. Consequently, given the significance and potential of the public sector in the implementation of CE, it is imperative that the public sector embraces CE principles into their management of resources at the organizational level.

As some authors have argued, Public Sector Organizations (PSOs) have characteristics that are distinctive from private organizations, namely, at organizational and functional levels [16]. For instance, PSOs pursue multiple political and social goals rather than solely commercial objectives of generating profit. They provide services, facilitate resource reallocation, and/or undertake policy development [17], and PSOs are mostly service-oriented as they provide services (i.e., non-material goods) rather than manufacture products (i.e., material goods) like industrial companies [13]. It is thus important to consider the specific characteristics of public administration, which might have implications for the implementation process of CE. Specific opportunities and challenges might emerge in a public sector context that are not the same in a corporate context.

The state of research and practice of CE implementation at the organizational level shows a clear focus on the corporate sector and how private companies and manufacturing organizations can integrate sustainable and circular practices into their business models and manufacturing activities [18,19]. Indeed, the CE has been generally framed and operationalized through the 3Rs principles, which refer to Reduce, Reuse, and Recycle [20]. The Rs options have been proposed by scholars and used by practitioners and businesses with additional Rs practices ranging from Recovery for energy to the actions of Refuse, Repair, Refurbish, Remanufacture, Repurpose but also going all the way to Re-mine from landfills [12,21]. In addition to the Rs practices, several conceptual frameworks have emerged to assist organizations in implementing circularity [22]. For instance, the British Standard BS 8001:2017 was created to provide guidance to organizations in the transition towards a more circular and sustainable mode of operation [23]. This standard includes six overarching guiding principles, including system thinking, innovation, stewardship, collaboration, value optimization, and transparency, that any organization should strive for when thinking of the circularity of their operations and strategy [23]. Another popular framework and conceptual vision of the CE often used by scholars and practitioners is the ReSOLVE checklist conceptualized by the Ellen McArthur Foundation (EMF). This framework includes six areas of actions (Regenerate, Share, Optimize, Loop, Virtualize, Exchange) [24] and was adopted as a basis for various private companies and businesses to undertake CE implementation at the organizational level [4].

Additionally, there is also a rapidly evolving theoretical and critical literature on CE. This literature suggests that, in order to achieve a true transformation away from the linear model and towards a circular management of resources, practices and strategies should go beyond the minimization of waste and towards a reframing of human and social behaviors such as consumption patterns with practices inspired by the sharing economy suggesting various forms of collaborative consumption [25,26]. Other practices are aiming at building awareness, at increasing knowledge and acquiring the appropriate skills through the training of managers and employees in organizations, strategies focused on the human and social dimensions of organizations influenced by the field of Green Human Resource Management (GHRM) [27].

This focus on the private sector might be due to the fact that the corporate sector is pinpointed as having a larger environmental impact than the public sector as it includes productive activities [28]. In comparison, there is no research yet looking at how the CE integration in PSOs has been conceptualized and practiced, and there is no study reviewing the literature on the implementation of CE practices and strategies in PSOs. Therefore, the main aim of this research is to describe and analyze the CE practices and strategies mentioned in previous literature for PSOs. This study conducts an integrative literature review describing the state of current research on the engagement of PSOs in CE practices and strategies. Thereafter, it builds on this research landscape to tailor an understanding of how a PSO can be viewed as engaging in an array of CE practices and strategies towards the sustainable management of its activities and operations. The terms practices and strategies were chosen to represent the range of application of CE ideas and principles in PSOs considering two levels of implementation: CE elements pertaining to the operational level of PSOs and the strategic initiatives of PSOs that are linked to CE.

The present study draws on research undertaken on organizational sustainability in order to link CE to previous work on sustainability integration in PSOs and to develop an organizational circularity framework for PSOs. Indeed, integrating CE principles into the already existing organizational sustainability work of PSOs is critical to ensure that synergies between the two concepts are in fact created to reach greater levels of sustainability [3,29]. Consequently, the following section introduces the notion of organizational sustainability in the public sector and outlines areas of research on this topic. Thereafter, the methods and steps that compose the review process are clarified, followed by the description and analysis of the literature sample. Finally, the proposed organizational circularity framework for PSOs is presented and put into perspective with previous research, and the article ends with concluding remarks.

2. Organizational Sustainability Perspective of PSOs

Before the recent gain in momentum for the implementation of the CE, organizations including PSOs demonstrated growing interest in engaging in sustainability activities [30]. The concept of sustainability was judged as vague and lacking clear implementation methodologies, and thus has seen a loss of momentum in recent years [31]. Moreover, the relationship between sustainability and CE has not been clearly defined in the research [32]. Several authors investigated the types of relationship between those two concepts, highlighting the idea of CE as a condition, an approach, and a pathway towards reaching sustainability [3,33]. In the frame of this study, the contribution of CE to sustainability lies therefore in its practical approach, applying, for instance, the principles of Reduce, Reuse, and Recycle [4]. Despite the criticism, sustainability has been useful in creating global awareness of the importance of integrating in a balanced and systemic way the environmental, social, and economic implications of decision-making processes for current and future societal contexts [3]. Research on sustainable management of organizations has been developing and establishing multiple tools, instruments, and approaches in order to account for those dimensions, although a large emphasis has been put on the environmental aspects of sustainability [34]. Similarly, several reviews report that CE scholars have been focused mainly on addressing environmental sustainability, thus running the risk of CE implementation not being supportive of social or economic sustainability [20]. Consequently,

this paper argues that it is precisely because of the hindrances of sustainability as researched and practiced thus far that the study of CE integration in PSOs needs to look at what has been done previously in practice in terms of organizational sustainability. Taking an organizational sustainability perspective potentially enables CE to aim beyond current sustainable development efforts in PSOs and develop theoretical constructs of the concept that ensure the equal and continuous attention to the respect of the environmental limits, individual and social well-being, and economic prosperity.

Offering a comprehensive and holistic understanding, Lozano [30] proposed that organizational sustainability and its implementation process can be understood as:

> The contributions of the organization to sustainability equilibria, including the economic, environmental, and social dimensions of today, as well as their interrelations within and throughout the time dimension (i.e., the short-, long-, and longer-term). This entails the continuous incorporation and integration of sustainability issues in the organization's system elements (*operations and production, strategy and management, governance, organizational systems, service provision, and assessment and reporting*), as well as change processes and their rate of change. [30] (p. 16)

Organizations are seen here as complex systems that have multiple, nonlinear, connected processes in interrelated units involved in joint problem-solving to accomplish a common goal [35,36]. As listed above by Lozano [30], those interrelated units in which sustainability must be integrated are the organization's system elements, which he divided in six distinctive areas. Domingues et al. [37] adapted Lozano's perspective of a company system to a PSO, where the following parts of a PSO were acknowledged in relation to their representation in sustainability reporting: (1) an institutional framework with policies and governance structures, (2) public management and strategy, (3) public processes and services instead of operations and production, (4) PP as a point of entry to impact on supply chains, (5) organizational systems (including culture, leadership style, problem-solving, innovation), and (6) collaboration with other organizations. This conceptualization of a PSO is shown here as an example of a model that can help to foster an integrated and structured approach for the identification and analysis of a combination of CE-related practices and strategies that can or are taking place in a PSO, contributing to further implement sustainability efforts.

Previous studies have focused on the analysis of approaches and tools that were developed to manage, measure, and report various aspects of sustainability in PSOs [38,39]. Two of the powerful tools that the public sector has to leverage sustainability in society as well as to foster organizational sustainability within its structures are the Green Public Procurement (GPP) and Sustainable Public Procurement (SPP) [40] procedures. GPP refers to the incorporation of environmental criteria in addition to the economic aspect in the procurement process of products and services of PSOs [41]. SPP concerns the integration of broader sustainability aspects, including social impacts, into the purchasing processes of governments [42,43]. The power of the transition of such procedures lies in the fact that PP and the purchasing of services, works, and supplies cover about 14% of European GDP and thus can substantially influence markets to produce more sustainable products and services [44,45].

In addition, a significant volume of literature has examined the adoption of Environmental Management Systems (EMS) in PSOs, its benefits, and obstacles in the implementation processes [46,47]. EMSs are some of the most studied sustainability practices [11], with the leading EMSs being the EU Eco-Management and Audit Scheme (EMAS) and ISO: 14001 standard [48]. The implementation of an EMS enables an organization to manage, monitor, and improve its environmental performance [49], and thus can be associated with CE implementation for increased organizational sustainability.

Sustainability management practices, including sustainability assessment frameworks and the development of related environmental and sustainability indicators and methods, have been researched in detail [38,50]. This is a hugely important set of practices to implement as it allows the measurement and monitoring of the organizational performance of PSO processes against sustainability (or at least environmental considerations). This helps decision-makers to take appropriate actions in line with

sustainability [51]. Related to that, sustainability reporting has been studied as a crucial supporting transparency tool to communicate resource management information and sustainability performance data of PSOs to internal and external stakeholders [37,52,53]. From these studies, we learn that sustainability reporting is a valuable communication tool that encourages organizational change for sustainability in the public sector but that it is still at an early stage of implementation, highlighting a need of more widespread and consistent reporting approaches.

In contrast to studies that concentrate on one specific sustainability practice or approach, other studies propose giving an overview of environmental or sustainability practices and strategies in the form of environmental or sustainability profiles of certain types of PSOs. For instance, Ramos and Melo [54,55] assessed the environmental management practices in the Portuguese defense sector, which is one of the main sectors of central public administration. In addition, Nogueiro and Ramos [11] identified also the environmental profile of public administration, although focusing on the local level by presenting a picture of environmental practices and tools that were implemented in municipalities in Portugal. Finally, with an integrated view of sustainability incorporating environmental, social, and economic aspects, Figueira et al. [13] provided an organizational sustainability profile of central/national level PSOs in Portugal, looking at a set of the most important sustainability practices and strategies found in the literature. All these studies highlight practices and actions such as ecolabels, environmental or sustainability training of staff, and audits as essential practices of organizational sustainability management that have been implemented in PSOs.

All in all, taking an organizational sustainability approach to the implementation of CE in PSOs will help to place CE efforts in line with the legacy of sustainability in the public sector. It was demonstrated in this section that sustainability practices and strategies have been researched and integrated in public sector areas such as PP with incorporation of sustainability or green criteria in purchasing processes; in assessment and communication efforts with development of sustainability assessment frameworks, indicators, and reports; in internal operations and processes with implementation of EMS, resource, and energy efficiency initiatives to improve sustainability performance. Sustainability practices and strategies have also been examined from more holistic perspectives, incorporating practices that extend from GHRM practices related to social responsibility to financial and economic instruments.

3. Methods

Integrative literature reviews are particularly useful to address new or emerging issues [56]. Considering the current momentum around CE, the topic of CE practices and strategies in PSOs is an issue that would benefit from a synthesis of the literature as no picture of existing research has been undertaken so far on this topic. Additionally, integrative literature reviews have demonstrated significant contributions to new knowledge by facilitating initial or preliminary conceptualization of a topic [56], which is one of the objectives of this research. Choosing to conduct an integrative literature review on CE practices and strategies in the public sector is particularly appropriate as it also allows for the selection of relevant studies through a broad sampling frame of diverse sources, including theoretical, empirical, academic, and non-academic sources [57].

The first step in the review process involved a systematic search to access published articles related to CE implementation in PSOs. The methodological approach to define the sampling frame was structured using a procedure inspired by Tranfield, Denyer and Smart [58] that proposes a review process in three stages: planning, execution, and reporting; see Figure 1 for an overview of the literature review process. This procedure ensures the quality and validity of the review.

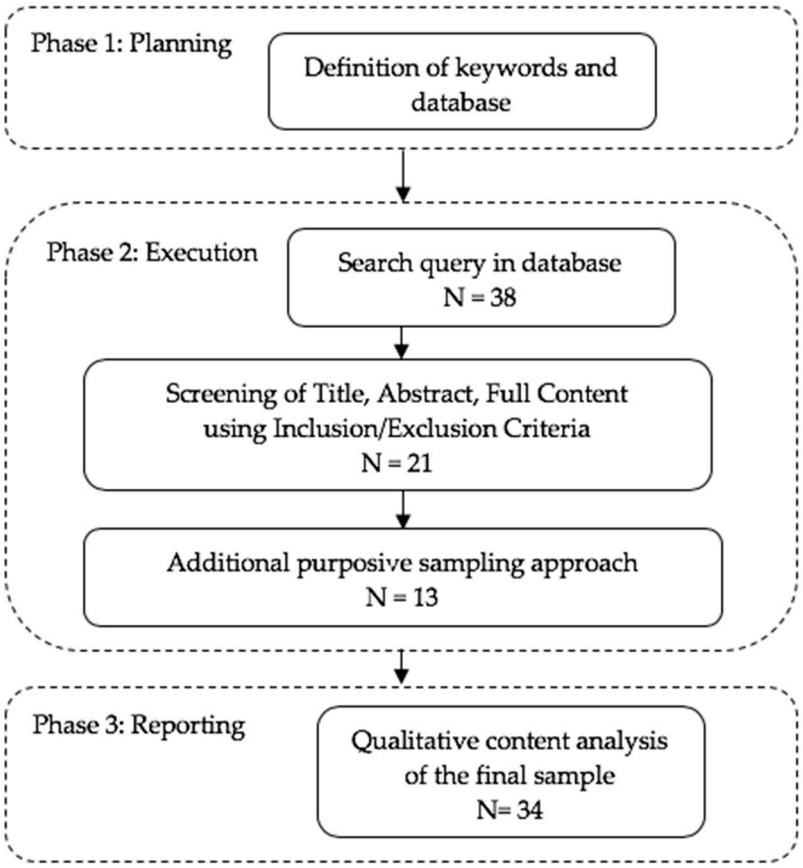

Figure 1. Overview of the methodological approach adapted from Tranfield, Denyer and Smart [58].

In the planning phase, keywords and terms were defined according to the aim and main topic of the study, which was to identify the level of knowledge and work undertaken so far regarding CE practices and strategies in PSOs. Consequently, a combination of three sets of terms were selected to ensure a high level of relevance of the resulting documents. Firstly, the expression "circular economy" was included to make sure that the articles were consistent with the main topic. Secondly, the terms "practices", "tools", "strategies", "actions", "initiatives", "instruments", "approaches", "operations", "frameworks", and "principles" were added using the operator "or" in between them in the search expression to incorporate terms related to the implementation of CE ideas at the organizational level. These terms were selected as they are frequently found in CE and organizational sustainability literature as seen above. Finally, all the pertinent expressions related to the public sector at the organizational level were inserted to enable the selection of relevant CE implementation articles. The terms included were "public sector", "public organizations", "public administration", "public agencies", "public management", and "public institutions" with the operator "or" to connect them in the search expression. In addition, the term "public procurement" was incorporated into the search as it is recognized as one of the most significant tools of the public sector to drive the CE transition both at macro level and at micro level within public administration [59].

The query was designed to search for the chosen terms in the title, abstract, and the keywords of publications. These terms were considered to be broad enough to capture the most significant literature on PSOs in the field of CE implementation. However, it is important to acknowledge that some material may have been missed and not included within this review. Thus, the present integrative review does not pretend to be an exhaustive scope of examination, but it claims to be an indicative sample of the knowledge on the topic of CE implementation within PSOs at a certain point in time. The terms were used in a complementary manner, which enabled each one to add publications to the search results. Using the Scopus database, the search query returned 38 documents as a result. Several

inclusion and exclusion criteria were then developed to select only the relevant papers. The titles, abstracts, and, in some cases, the full text of the resulting sample were screened for relevance according to the inclusion and exclusion criteria presented in Table 1.

Table 1. Inclusion and exclusion criteria used in the screening process.

Inclusion Criteria	Exclusion Criteria
Conceptual and empirical studies on circular economy (CE) practices and strategies examined in public sector organizations (PSOs) at the organizational level	Studies on CE policies and governmental interventions referring to the macro level
Studies mentioning CE practices and strategies for PSOs, although the public sector might not be the main scope of those studies	Studies mentioning the importance of government as a regulatory entity for society and companies

The selection of papers was guided by the decision to include conceptual and empirical studies that exclusively focused on CE practices and strategies in PSOs, as well as studies of broader scope that mentioned CE practices and strategies for PSOs, even if the public sector was not the main focus of analysis. As this review was targeted to look at the organizational level of public administration, studies related to the analysis of public policies and governmental interventions pertaining to the macro level were excluded from the literature sample. It is important to note that although public policies, plans, and programs are one of the main outputs of the public sector [16], the analysis of specific policies related to the CE represents a distinctive field of research and therefore was considered as a separate domain out of the scope of this research. Similarly, publications mentioning only the importance of government as a regulatory entity for society and companies were also considered as irrelevant in the context of the present research, as PSOs are conceptualized here as an actor in the economy rather than a facilitator.

After the screening process, the final sample from the systematic search included 21 scientific papers. To obtain a larger sample beyond peer-reviewed sources, as CE and its examination in PSOs is an emerging area of research and might not have been solely addressed by peer-reviewed articles accessible through Scopus, this systematic selection of papers was combined with a purposive sampling process to incorporate another set of 13 academic articles, non-academic publications, and reports from non-governmental and international organizations that were identified based on the authors' knowledge of various sources outside of the scope of the search query [57]. Nevertheless, the authors acknowledge the probable emergence and existence of other reports and publications on PSOs in the field of CE implementation because of the rapid evolution of CE research. As a result, the final corpus of documents included in this research amounted to 34 publications.

This study adopted a qualitative content analysis approach [60] to examine the selected documents by searching for underlying themes in the literature. The identification of the themes was taken and adapted in parts from the organizational sustainability approach of PSOs as viewed by Lozano [30] and Domingues et al. [37] that identified distinctive dimensions of PSOs in which sustainability is important. These included areas such as procurement and communication, strategy and management, service provision, assessment and reporting, and collaboration with other organizations. This overarching perspective of PSOs offered by organizational sustainability will help identify and inform on the type of PSO areas to which research into the implementation of CE could be linked.

4. Results and Discussion

A significant proportion of the literature sample focused on the study of CE practices in PP processes, and therefore an entire section of the results is dedicated to circular PP practices. The rest of the reviewed sample was linked to two other identified areas of PSOs. The second area was the exploration of CE practices in internal operations and day-to-day work processes and procedures

of PSOs, with a majority of those papers studying the implementation of CE in Higher Education Institutions (HEI). According to the EC, HEIs fall into the public sector category because some universities are labelled as public universities [10]. The third aspect of PSOs that was analyzed in relation to CE in the sampled literature was the delivery of public services and how circularity can be integrated into public services facing citizens and society. Consequently, the literature review is divided in three parts according to those three major themes identified as the main areas pertaining to PSOs that have been touched upon in the CE implementation literature so far. Table 2 provides an overview of the division of the literature sample into those PSO areas.

Table 2. Categorization and summary of the final literature sample.

PSO Areas	Publications
Public Procurement (PP)	Dahl Sönnichsen and Clement [44]
	Migliore et al. [61]
	Marrucci et al. [62]
	Öhgren et al. [63]
	Crafoord et al. [64]
	Gåvertsson et al. [65]
	Alhola et al. [66]
	Witjes and Lozano [67]
	Ammenberg et al. [68]
	Hermoso-Orzáez et al. [69]
	EC [70]
	UNEP [71]
	De Groene Zaak [72]
	EMF [24]
	Rainville [73]
	Campbell-Johnston et al. [74] *
	Milios et al. [75] *
	Prieto-Sandoval et al. [76] *
	Milios [5] *
Internal Processes and Operations	Jones and Comfort [77]
	Mendoza et al. [78]
	Mendoza et al. [79]
	Nunes et al. [80]
	Seifert et al. [28]
	Ganapati and Reddick [81]
	EC [10]

Table 2. *Cont.*

Public Service Delivery	Grohmann et al. [82]
	Lewandowski [83]
	Lewandowski [84]
	Torrieri et al. [85]
	Bao et al. [86]
	Santos et al. [87]
	Qi et al. [88]
	Gorbatchev and Zenchanka [89]

* Publications mentioning only the importance of CE in PP.

4.1. Circular PP Practices

Integrating CE principles as criteria or technical specifications into PP processes appears to be one of the most discussed CE strategies in research so far. Indeed, 19 out of 34 publications examined or mentioned the importance of integrating and identifying CE principles in the processes of GPP and SPP. Ten publications indicated in total about 50 PP good practice cases that have CE-related characteristics. These good practice cases featured in both the academic and non-academic publications demonstrate that integrating CE principles into PP processes is a growing interest and a practice that presents great potential in the frame of GPP and SPP. Some of the cases mentioned were cited as examples by several publications. For instance, the case of Herning Municipality in Denmark was mentioned twice; the municipality purchased working clothes and uniforms in 2013 with the creation of technical specifications and leasing contract performance clauses related to maintenance, repair, and recycling, which enabled it to extend the lifespan of the uniforms [66,70].

The literature seemed to divide circular PP efforts between those introducing CE technical specifications for the product itself and those introducing criteria promoting circularity in the process of procurement [71]. As shown in Table 3, product-focused specifications seem to be most applied and researched for remanufactured products and for recycled content in products purchased, with 12 and 13 good practice cases identified respectively. Conversely, requirements for recyclability and the disassembly of products appear to be less widespread in the literature, with only four cases identified for these categories altogether. A reason for this result might be that certain circular criteria are more easily incorporated in current PP processes. Moreover, highlighted in six studies, new considerations in the procurement processes are taken into account to help with the sustainable use of resources in PSOs [70]. Examples are found in the food and catering sector, where new approaches to the handling, processing, and delivery of products are presented. The sizes of the lots ordered, seasonal food opportunities, local production and cooperation, logistics, experiments, and innovative recipes are considered as criteria for procurement [66].

Furthermore, the procurement of services instead of the products seems to be an increasing practice, designated in seven publications. Indeed, Milios [5] and Öhgren et al. [63] highlighted the potential of product–service systems solutions to promote circularity and also recognized the challenges of overcoming "a web of technical, institutional and regulatory barriers [that] can impede such solutions and that extensive work in change management is required in order for such procurement to progress" [63] (p. 155). On the other hand, business models such as sharing services or alternative waste management systems tend to be less present in the literature. However, another article linking CE and sharing economy in the public sector stated that "many public agencies have already begun to change procurement practices focusing on peer rental" [81] (p. 81). Another example of integrating CE criteria through business model change was mentioned in the EMF report on a toolkit for policy-makers where publicly owned hospitals in Denmark could adopt performance-based business models in

procurement for imaging/radiation equipment and choose access over ownership business models for a broad range of products, thus becoming leaders in recycling and waste reduction [24].

Table 3. Categorization of the circular good practices in PP found in the literature sample.

PP Practices Category	CE Sub-Category	N° of Good Practice Cases
Promoting product-focused criteria for CE	Longer Life Span (Remanufacture/Reuse)	12
	Recycled content in products	13
	Recyclability	1
	Design for disassembly	3
	Renewable sources	5
	New conditions for sustainable use of resources	6
Promoting business models for CE	Product-service systems, Leasing	7
	Sharing platforms/services	2
	Innovative waste management systems	1
Total number of circular PP good practice cases		**50**

Those PP practices recognized in the selected literature cover a wide range of sectors. The most generally identified is the construction and infrastructure sector, with several cases requiring the use of recycled material in the construction of public buildings. This result was consistent with the current literature on CE stating that "the construction industry is the biggest buyer of resources, and has become a leading greening industry: the reuse of materials instead of disposal is today the preferred option in most new infrastructure projects" [59] (p. 43). Thereafter, Table 4 highlights that the sectors of furniture and transportation seem to be significant circular PP sectors. Requirements for remanufactured furniture, for the possibility of disassembly of furniture, as well as for the leasing of furniture were the specifications identified in the selected papers. Procurement of buses fueled with biowaste [66,68] as well as the procurement of car-sharing services for public administration employees [70,71] were mentioned in multiple studies as prevalent practices. One of the reasons that those sectors are prominent in this review might be because they are some of the major product categories of EU's GPP voluntary instrument [70].

Table 4. Sectoral distribution of the circular PP practices found in the literature sample.

Sectors	N° of Good Practice Cases
Construction and Infrastructure	12
Furniture	8
Transportation	6
ICT products	6
Waste management and sewage treatment	5
Food	3
Textiles	4
Cleaning products	3
Print and paper	2
Cross-sectoral	1
Total n° of cases	**50**

Additionally, extending the lifetime of Information and Communications Technology (ICT) products such as computers through the procurement of remanufactured and/or reused electronic equipment and the use of related ecolabelling of such devices in PP was researched by Crafoord et al. [64] and Gåvertsson et al. [65]. The use of the European Ecolabel in particular was also pointed out as a useful environmental criterion in GPP to promote its implementation on products in a study assessing the growing acceptance of the EU Ecolabel in the European Union and Spain [76]. This mention of the EU Ecolabel is linked to CE because the label identifies products that have a reduced environmental

impact throughout their lifecycle [90] and also because it is supported by the most prominent common market and consistently updated with ecological criteria in line with CE [76]. One of the analyzed works highlighted also the potential of introducing labels indicating the amount of recycled or reused material and components in products to advance CE practices, although there is a need for circularity metrics to assess such performances [61]. Ecolabels are considered a key tool informing the public procurers in the design of public tenders where ecolabelled products represent a guarantee that the product has the associated environmental or circular requirements [44]. These results confirmed observations made in previous studies on environmental labelling acknowledging that public agencies are encouraged to use environmental and social labels in their acquisition processes to improve their sustainability profile [13]. Similar to the use of ecolabels, the use of Life Cycle Assessment (LCA) and life cycle costing were demonstrated as key decision-making criteria for the selection of bidding companies for a change of public outdoor lighting to LED technology [69]. That study proposed a novel multi-criteria model where aspects of environmental impacts generated in the manufacturing processes of LED luminaires evaluated by LCA techniques were considered in the decision to opt for LED developments in public lighting, in addition to economic and technical aspects. Although the use of life cycle thinking tools such as LCA does not guarantee the circularity of products, it is a useful tool that contributes to CE by evaluating products and services, thus enabling criteria setting and helping procurers understand the amount of emissions and impacts, produced and embedded [44].

The waste management and sewage treatment sector was also highlighted, with the recycling and reuse of nutrients in the treatment of sewage sludge as a PP criterion and the procurement of waste separation systems as a CE purchasing practice [66]. The purchasing of sustainable food or catering services, of textiles promoting the reuse, repair, and disposal of working clothes [73], as well as specifications for recycled and recyclable cleaning products and paper were also highlighted in the sampled literature [70]. All these sectors were consistent with the major sectors relevant to procurement by the public administration sector, as indicated in a Joint Research Centre (JRC) report that identified the best environmental management practices in this sector [48].

In addition to the circular PP practices mentioned, other studies highlighted the importance and potential of implementing CE principles in PP processes as a driving force in accelerating the transition towards CE and sustainability, for instance, to promote CE in cities [74], to boost the plastic waste recycling industry by introducing requirements of recycled plastic in products [75], and to allow innovative product–service system solutions to enter the market by implementing PP for innovation [5]. Moreover, Marrucci et al. [62] linked GPP as a Sustainable Consumption and Production (SCP) tool to CE in the consumption phase by advocating that integrating CE principles into PP processes can help buyers take a more holistic approach to sustainability and help GPP to move beyond the classic process of procuring only, with the goal of reduced environmental impact but also considering closed energy and material loops within entire supply chains.

Interestingly, all the publications from the literature sample examining the integration of CE into PP pointed out that, despite the identified efforts to start the incorporation of CE in PP processes as seen through these 50 cases in practice, there is still a slow implementation of such practices generally. The complexities, challenges, and barriers highlighted by these authors refer to issues regarding the lack of knowledge, competence, experience, and skills, and thus a lack of training [5,64,66]. In this context, several authors highlighted the need for investments in education and training initiatives to enable procurers to identify more easily opportunities for circularity in PP and emphasized the need for more cooperation, dialogue, and exchange of experiences among public authorities to spread best practice and to scale up the successful achievements in the development of procurement criteria and contracting conditions [63,71]. Furthermore, Dahl Sönnichsen and Clement [44] concluded from a literature review that key in implementing circular PP are organizational aspects such as top-managers and cross-departmental management having a leadership and strategic perspective; individual behavioral aspects such as human agency, motivation, and beliefs; and operational tools such as ecolabels, LCA, and life-cycle costing. Most importantly, the main conclusion consistently highlighted was that

awareness and knowledge are clear success factors, which "through education, training and clear political goals are all crucial to enhance circular public procurement and to support effectiveness in the tender process" [44] (p. 9) via initiatives such as best practice training, workshops, and monitoring.

Studies also referred to the lack of interaction with markets and companies as a key reason for the slow transition to circular PP [66,70], hence stressing that collaboration with suppliers and other organizations is crucial to successfully implementing CE principles in PP. Witjes and Lozano [67] demonstrated that collaboration entails a change of focus from the technical specifications set up by the procurer to a more collaborative discussion of the definition of the proposed technical and non-technical specifications between the supplier and procurer, thus enabling parties to gain experience. Rainville [73] showed how innovative cooperation mechanisms, specifically, how the role of consultations with external groups, of intermediaries between buyers and suppliers during the pre-procurement phase, of articulating and defining the appropriate demand with ambitious criteria play a critical role in the success of ensuring procurement and its market impacts. Furthermore, the United Nations Environment Programme (UNEP) report on circular PP [71] emphasized the similar point that engaging market dialogue already in the design and definition of specifications phases is critical to ensure embedded circularity, to enable co-creation of circular solutions, and to trigger innovation. These results indicate a need for a redefinition of the current PP rules and processes and for a redesign of the way PSOs are setting up contracts [63]. In fact, this redefinition is argued to be a matter of changing the collaboration dynamics that are currently in place in conventional PP processes. Integrating CE principles into PP also means incorporating different ways of doing procurement, different ways of collaborating between stakeholders. Collaboration is one of the guiding principles of CE, according to the British Standards Institution (BSI) framework for CE [23].

The high proportion of studies related to PP and CE in the literature sample reflects the importance and potential of PP as a leverage point for the CE transition that is pointed out in the general CE literature. Introducing CE-related criteria in PP processes is one of the unique tools related to organizational sustainability, which also has a considerable impact on the market, companies, and supply chains [72]. Considering the public sector, its ministries, agencies, and departments as buyers of resources that have the duty to purchase responsibly is one of the main roles that PSOs must shift from linear to circular thinking.

4.2. CE Practices and Strategies in Internal Processes and Operations

When considering PSOs as consumers and users of resources, their internal processes and operations are an important area of action where CE practices and strategies have the potential to contribute to sustainability. In total, seven publications were found with CE practices and strategies pertaining to this area of PSOs, such as the collection and recycling of used work uniforms, the recovery of heat from data centers [77], the provision of reusable mugs, the implementation of a marketplace online platform for the reuse of products and furniture by staff, as well as circular approaches to lighting and heating in buildings, to water management such as automated taps and smart flushing in toilets, and approaches to waste management by providing recycling facilities [79,80].

Four out of the seven works investigated the implementation of CE in Higher Education Institutions (HEIs) [10]. These publications highlighted a good level of engagement in CE practices from this type of PSO, although they concluded that the majority of initiatives are oriented towards energy and resource efficiency, product-life extension, waste reduction, and recycling, as well as emissions reduction [78,80]. In one of the works, a participatory method was used to show that the four most valued strategies to start the implementation of CE in a HEI are to (1) encourage refurbishment and leasing of remanufactured furniture, (2) offer the choice of reusable mugs and food containers with take-back systems, (3) establish pay-per-use systems for appliances, and (4) pay-per-lux systems for the provision and maintenance of lighting equipment [78]. Similarly, the EC report presenting best practices to implement CE with an EMAS gave the example of a German university certified with an EMAS as a PSO case study. It highlighted CE initiatives according to four categories: (1) initiatives

related to the procurement of sustainable products; (2) initiatives optimizing the use of resources such as for events and with the installation of separated waste-collection systems; (3) initiatives improving the design of products and processes with digitization of administration processes, online meetings, and e-learning programs; and (4) initiatives aiming at the minimization of waste by promoting, for instance, the use of reusable dishes, bottles, and cups, as well as sharing platforms for various goods and services [10]. Moreover, in the other study undertaken by Mendoza et al. [79], a background analysis was done to get an overview of a university's engagement in CE by analyzing their main resource and sustainability policies against the EMF's ReSOLVE checklist. The results showed that most of the sustainability strategies belonged to the Optimize action area of the ReSOLVE checklist, with initiatives related mainly to reducing the greenhouse gas (GHG) emissions from the energy, travel, construction, and purchasing sectors [79]. Additionally, the EMF's report indicated public administration and defense as economic sectors in their analysis and evaluated that the areas of Share and Virtualize have the highest priority and relevance [24]. This coincided with the results from the previously mentioned papers on the HEI's increased interest and acknowledged opportunity of adopting performance-based models for lighting, heating, and the use of appliances, and of having sharing initiatives enabling the reuse of products and other services.

A number of practices related to the sharing economy for PSOs were examined by Ganapati and Reddick [81], who argue that public agencies have the potential to become users of the sharing economy. Digital government platforms to share and use the in-house equipment at capacity, or the use of ride-hailing and car-sharing services by employees to make trips on demand, or even the use of coworking practices such as teleworking or desk-sharing, for instance, enhance the scope of sharing underutilized assets within large government agencies and between different government agencies. PSOs can thus use assets at capacity for both realizing internal organizational efficiencies and enhancing external public services [81].

Although the CE practices and strategies highlighted above were valued by the authors as a valid starting point and evidence of CE implementation within PSOs, they have also been characterized as incremental and limited to the scope of tackling resource efficiency and waste reduction rather than promoting the rethinking of current unsustainable processes [80]. Consequently, the results of these studies suggest that the implementation of further CE-related initiatives encourage the development of eco-effective mindsets and behaviors, resulting in long-term organizational sustainability [80]. CE and sustainability training and complementary education of students, employees, and leaders are recommended to tackle the lack of understanding on the practical application of CE and the lack of leadership support and exemplary pro-environmental behavior by leaders that would help motivate employees to be more aware and act in a more sustainable way thereafter [78].

These studies also emphasized the need to promote more radical changes by calling for the creation of dedicated working groups, for new governance dynamics, and for increased collaboration with other universities, local businesses, and other relevant stakeholders on CE-related topics to co-create solutions for shared benefits and mutual support for all parties involved [79,80]. Another challenge identified in the literature is the lack of appropriate assessment-based decision-support frameworks, data collection, reporting systems, and circularity performance indicators to further embed CE thinking in PSOs [78]. This observation was also made by Migliore et al. [61] regarding the development of reuse and recycled content labels on products available for procurement.

Furthermore, it is critical to mention that several studies in this section, such as Mendoza et al. [79], identified the importance of organizations to decide on the strategic value that CE would bring to the organizational sustainability management and the need to adequately embed those values in the policies, goals, and priorities of the organization so that the development of CE practices and strategies have the potential to go beyond incremental improvements and radically challenge current activities.

While investigating the organizational environmental performance of three wastewater treatment plants as a type of PSO, Seifert et al. [28] also observed that there is a strong focus on end-of-pipe solutions that do not consider upstream activities and other relevant stakeholders influencing the environmental

impacts of wastewater. In order to change this traditional paradigm, which is concentrated mostly on downstream practices such as those related to energy and resource efficiency, as previously mentioned in other articles [78,80], this study highlighted the need to reduce this focus by acting on upstream activities and rethinking current practices in a whole sector. The authors suggested that this could be done through information exchange with other organizations in the sector, through active involvement of local and national associations that could contribute to changes of current potentially unsustainable activities, and through increased stakeholder dialogue in addition to improvement of the organizational environmental performance of the wastewater treatment plant public service organizations.

This section analyzed the few publications related to the integration of CE into the internal operations part of PSOs, with the main focus on HEI. Consequently, there is a need for complementary empirical studies on how the integration of CE ideas is taking place in other types of PSOs and for more conceptual approaches and frameworks to assist and ensure that the implementation of CE is providing authentic sustainability benefits.

4.3. CE Practices and Strategies in Public Service Delivery

Eight studies were found that identify opportunities and suggest new practices using CE principles to help public services contribute to a more sustainable management and performance of the public sector. Grohmann et al. [82] explored the potential reuse of pruning waste collected on public land as a material source to create panels for thermal insulation, and thereby contribute to the sustainable management of public urban areas. Another work also examined the practice of reuse in the context of heritage buildings such as monasteries, proposing an integrated evaluation model to support the choice of the best alternative reuse of these types of buildings, thus optimizing the use of public spaces and public buildings [85]. Moreover, the public transport sector was also highlighted with a study examining the use of buses fueled with renewable energy in the form of biogas as an innovation that reuses biowaste from the treatment of sewage, food waste from households, and manure to deliver the service of public transport [68]. The presence of these studies in the literature sample indicated that there is a focus on the practice of reuse to implement CE in the public service delivery area of PSOs.

The sharing economy was also emphasized as having the potential to enhance traditional public services by providing access to the services on demand anywhere and anytime, according to Ganapati and Reddick [81]. Linking the sharing economy to the smart cities concept, PSOs can leverage the power of information technology to deliver public services by efficiently using resources through peer-to-peer renting.

In the waste management sector, Santos et al. [87] examined the use of CE-related measurement tools such as social LCAs to help improve municipal services with the management of illegal waste dumping sites on public areas in a more sustainable way, thus highlighting the importance of CE-related assessment and performance measurement tools such as LCAs in the implementation of circularity within public service delivery. This result was consistent with the sustainability management literature that acknowledged the importance of assessment methods to support decision-making processes in PSOs and to improve the management of resources and mitigate their impacts on the environment, society, and the economy [91].

Furthermore, Lewandowski [83] introduced the concept of the Public Sector Business Model (PSBM), where a business model framework is applied to PSOs. Lewandowski pointed out the benefits of business model innovation for PSOs for the delivery and capture of CE value [86]. A PSBM is a multiple-value creation system of public services with a co-creation delivery-capturing process involving the active participation of stakeholders and various forms of cooperation. In other words, the author proposed a conceptual model of how PSOs have the potential to co-produce more circular public services together with companies and civil society. Referring to the CE as defined by the ReSOLVE action areas, the study argued that design is the entry point to incorporate circularity in PSBM, involving the active participation of citizens and companies in the creation and delivery processes of the public services [84]. As an example of this engagement process contributing to CE,

the author gave the example of the implementation of under-the-pavement wireless charges for electric public buses in the city of Tel-Aviv in Israel. The installation of these wireless charges is seen as a CE practice through the application of advanced technology replacing older solutions, referring to the ReSOLVE action of Exchange from the EMF checklist of actions. This initiative shows that, in its design and testing phase on a portion of a specific bus route, the public sector worked together with a company to design and deliver a public service in an alternative way in line with CE principles, which has the potential to benefit all parties financially, politically, and in terms of citizen satisfaction.

Three studies focused their research on the benefits of Public-Private Partnerships (PPPs) as a valuable strategy to improve the sustainability and circularity of public service delivery. PPPs are beneficial strategies contributing to CE when they improve public services through the involvement of the private sector in the application of CE principles. Qi et al. [88] examined, for instance, a PPP in the context of an industrial solid waste exchange case in China, where the private sector is working with the public sector and educational organizations to design a collaborative program of material exchange undertaken by manufacturers rather than by local government facilities. This example of PPP is considered a CE public service because an industrial symbiosis network was viewed by the authors as an environmental protection service. Similarly, Gorbatchev and Zenchanka [89] demonstrated how three examples of PPPs helped to improve the municipal waste management system in Belarus through the incorporation of the private sector to collect waste and recover recyclables or to install a degassing process reducing the amount of greenhouse gas (GHG) emissions from the landfills. Additionally, the paper by Bao et al. [86] presented a case where the development of a PPP is used as an innovative procurement model for the public sector to recycle their construction and demolition waste. Procuring and using a recycling service from the private sector to manage and close the material loop in the public sector through the recycling of waste emanating from the construction and demolition of public buildings is another example of collaborating and using synergies from both the private and public sectors to change public service delivery towards more circularity.

Similar to the previous sections, the results of this section also highlighted that collaboration and stakeholder engagement are crucial aspects and values to incorporate in PSOs so that CE is appropriately implemented. This observation might be due to the fact that the implementation of CE depends on the context and circumstances in which the practices and strategies are implemented. This aspect was pointed out by previous literature arguing that some practices and strategies pertaining to CE might not be appropriate and sustainable in a given case and thus calling for "a broader and much more comprehensive look at the design of radically alternative solutions, over the entire life cycle of any process as well as at the interaction between the process and the environment and the economy in which it is embedded" [92] (p. 12).

5. An Organizational CE Framework of PSOs

The results of this study showed the scattered landscape of research on CE practices and strategies in PSOs, thus indicating that the research has focused so far only on certain areas of PSOs without an encompassing view. There were clear similarities between the practices and strategies pertaining to sustainability management in PSOs and the practices found in the literature review on CE in the public sector. As acknowledged in one of the publications, "learnings from sustainability management can be taken into account to facilitate an integrated and systemic CE implementation" [78] (p. 564). Consequently, based on the results of the literature review and by adapting the organizational sustainability dimensions of a PSO to the context of CE at the organizational level, this section presents an organizational CE framework of PSO dimensions to provide a systemic overview and understanding of the integration and implementation of CE practices and strategies in PSOs.

The results of this research showed that the studies in CE implementation in PSOs mainly cover the areas of PP, Internal Operations and Processes, and Public Service Delivery. These three dimensions were therefore highlighted in bold to reflect the prominence of these PSO areas in the CE literature. Furthermore, throughout the results and discussion, specific aspects of PSOs were

pointed out as important dimensions to examine, which can also be found in sustainable management literature [30,37], such as the collaboration with other organizations like markets, suppliers, local and national associations. Also, the importance of human resources dimensions was recurrently highlighted and referred to the importance of people as employees and managers, their skills, learning abilities, the organizational culture, internal cooperation, innovation, and change management practices. Taking an organizational sustainability perspective, the dimensions related to strategy and management, assessment and communication, and the various macro-level contexts were included in the framework as seen in Figure 2 although these dimensions were not prevalent in the literature review, therefore they were not indicated in bold. They are nevertheless important areas to consider in the implementation of CE in PSOs, as the values of strategy, assessment, and communication was mentioned in the literature. It is worth pointing out that these different areas or dimensions of PSOs of this framework are interlinked and not mutually exclusive in terms of CE practices and strategies, as the interactions and links between each parts of an organization are never separated and isolated [35]. Moreover, it is also important to acknowledge that there are many different types of PSOs, and that this framework is a broad representation of the basic common activities and tasks undertaken by PSOs at the organizational level. Each of the areas will be characterized in further detail in the next sub-sections.

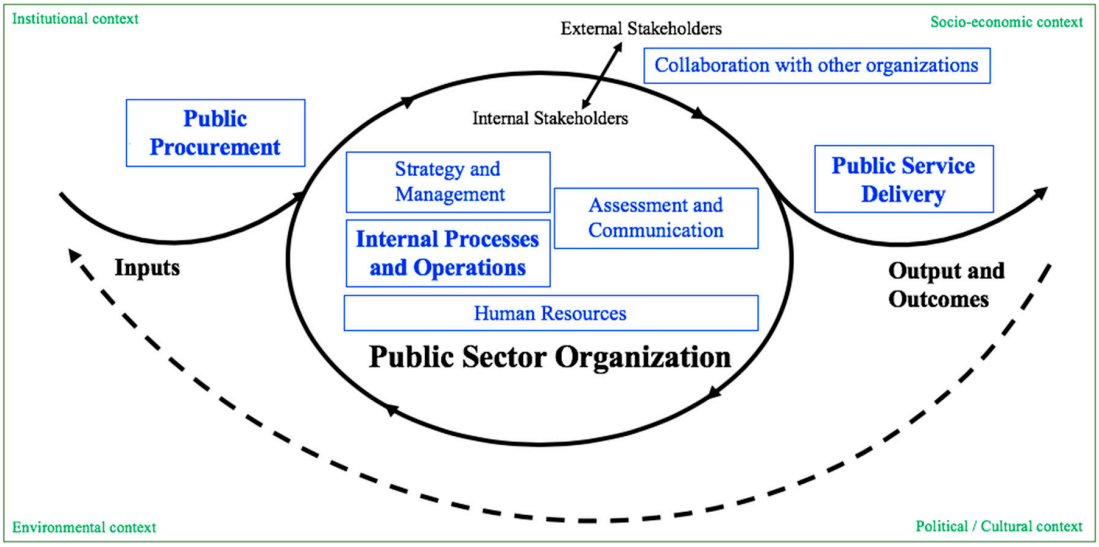

Figure 2. Framework conceptualizing a PSO into relevant areas in which to examine the integration process of CE practices and strategies.

The framework further depicts a PSO as a system comprising those interrelated dimensions and that is provided with inputs such as material and human resource flows, as well as information and service flows provided by PP structures circulating into the system. The PSO system also produces outputs such as waste and information flows and outcomes in the form of public services and public policies. Implementing CE practices and strategies in a PSO contributes to developing ambitious CE policies and efficient sustainable public services accelerating the transition at societal level that in turn the outcomes are encouraging the public sector to act in alignment with CE principles as purchasers and consumers of resources. See Figure 2 for an overview of the framework.

5.1. Public Procurement

Based on the fact that the majority of the papers reviewed in this study examined the integration of CE criteria into PP processes, the area of PP is considered as one of the most important and impactful in this organizational CE framework of PSOs. PP is recognized as one of the main policy instruments that the public sector has to leverage in order to speed up the CE transition in society [5]. More importantly, this area of the public sector was included in this framework because it represents

an internal process serving the public administration sector in the purchase of products and services, which corresponds to 14% of EU's annual GDP [10,44]. Therefore, including appropriate CE criteria or technical specifications for those products, or alternatively buying performance and innovative services, is a considerable advancement in the transformation of the public sector and, more largely, of the economy and society to more circularity and sustainability in line with the planetary boundaries. As seen in the results, there is a need for further research on the integration process of CE elements into PP procedures, especially in the development of product–service systems solutions for PP and to explore how to overcome the multitude of barriers currently hampering the implementation of innovative PP solutions, such as tackling the lack of knowledge, awareness of procurers, suppliers, and other relevant stakeholders [5,44], or addressing the need for more cooperative and collaborative ways of designing PP contracts and appropriate circular criteria [63,67].

5.2. Internal Processes and Operations

The internal processes and operations of PSOs are considered one of the crucial areas of the public sector for the examination and integration of CE practices and strategies, according the results of the literature review. This area of activity in the public administration sector represents a large variety of different activities ranging from "policy making, to revenue collection and budgeting, human resource management, and the delivery of municipal services [. . .] such as social housing, transport, education, libraries, leisure, waste collection, emergency services" [48] (p. 41). While acknowledging the diversity of processes and operations, PSOs are commonly and for the most part dealing with managers and employees working in office buildings undertaking office-level tasks. As seen in the literature review and similar to conclusions from previous public sector organizational sustainability studies, the CE practices and strategies related to internal processes and operations pertain mainly to energy and water efficiency in public buildings, product-life extension practices of products such as furniture or electronic equipment, reduction of paper use and dematerialization of administrative processes, sustainable management of meetings and events, and waste reduction and recycling initiatives [78,80]. These types of CE practices and strategies correspond to the traditional "end-of-pipe" approaches [28] stemming from fields such as industrial ecology, which focus on closing and reducing energy and resource flows from a technical and engineering perspective [93], which this study reported as bringing only incremental improvements to the CE transition. Nevertheless, the circularity of internal processes and operations is an indispensable area to address. Furthermore, the results of the literature review showed that CE research in this central area of PSOs seems to have focused so far on analyzing the implementation of CE in HEI processes and day-to-day activities, which are a specific type of PSO. Therefore, there is a need for further research examining the integration of CE practices and strategies into the daily internal operations of other types of PSOs.

5.3. Public Service Delivery

The third public sector area highlighted by this review and an essential element of the organizational CE framework is the area of public service delivery. As pointed out in the literature review, a few studies have researched and explored CE principles as applied to delivering innovatively and collaboratively more sustainable public services in sectors such as municipal waste management, public transport, public urban spaces, and heritage buildings [68,85,89]. This aspect of the public sector related to its output and outcomes is of primary importance, as integrating CE practices and strategies has the potential to improve the efficiency and to transform the way that public services and the development of public policies are provided, having thus a considerable potential positive impact on citizens, their collective and individual behavior, their well-being, and on society and its overall sustainability. Consequently, further research, both at the empirical level through case studies and at the theoretical level, is encouraged to design and suggest alternatively delivered public services in line with CE principles that have a positive and transformative influence on society and the other sectors.

5.4. Human Resources

In relation to the PSO areas covered by the current CE literature previously presented, there are additional aspects of a PSO that are important to incorporate in the framework. Human resources and social-related dimensions of organizations were regularly mentioned in the results, referring to issues dealing with the lack of employee knowledge and the need for appropriate skills and innovative training and education initiatives to bring awareness and build the capabilities of individuals in organizations to take on CE practices, change their daily behaviors, and change the organizational culture thereafter [44,79]. The reviewed literature highlighted that those human-centered aspects are crucial to complement the CE practices and strategies that are limited to the scope of improving energy and resource efficiency and focus solely on reducing waste generation [80]. The organizational sustainability management literature [94] and the CE literature previously emphasized that it is imperative to include strategies that encourage people to rethink and change their current unsustainable practices, thus broadening the scope of CE integration to human aspects with more potential for a transformative societal shift towards sustainability [25,26]. Therefore, human resource and social dimensions are included as an area of PSO in the organizational CE framework for which academic research is needed as it has not been studied in a public sector context.

5.5. Collaboration with Other Organizations

Collaboration and interaction with other organizations and their involvement in the redesign of public processes towards CE were included in the framework proposed in this study as a result of the literature results. The results revealed that there is a lack of interaction with markets [66,70], a need for more cooperation mechanisms, dialogue, and information exchange among PSOs, but also engagement with diverse external stakeholders such as suppliers, universities, associations, companies, and citizens to allow for the co-creation of appropriate and adapted circular solutions for the public sector in all its areas of action and activity [28,73,84]. Further studies are therefore suggested to provide innovative, participatory, helpful tools to PSOs to increase the active engagement of a wide range of stakeholders in their operations and to tackle the barriers of silo structures in the daily work of the public sector, which hinders the implementation of CE practices and strategies [44].

5.6. Strategy and Management

The strategy and management area is a central piece of the organizational CE framework as a relevant dimension of PSOs contributing to their transformation towards circularity and sustainability. The importance of leadership and of the strategic level of the CE implementation process in PSOs were mentioned several times in the previous literature [44,79]. Also emphasizing the research on the integration of CE into strategic aspects is vital to ensure that the added-value of CE in PSOs effectively contributes to a sustainable management and that practices at operational level are implemented with a coherent and holistic view of the organization. This area relates to the integration of CE principles and ideas into strategic elements of public administration, such as statements showing the mission, vision, and objectives, as well as strategic plans and programs of PSOs [95]. More attention from academia is needed to help the development of clear strategic commitments and actions by the public sector to CE practices contributing to sustainability.

5.7. Assessment and Communication

Assessment and communication is also a main component of the framework referring to the importance of reporting and accountability in PSOs [37]. This is a dimension that was missing in the literature review compared to the other areas and to the state of research in public sector sustainability management, where performance assessment and indicators are significant topics of study [16], although the importance and need of appropriate CE indicators and measurements in the context of PSOs was highlighted by several authors [61,79]. Popular sustainability assessment methods and

communication tools such as LCA or ecolabels are also found in CE literature as key tools to measure, implement, and inform on the circularity of resource flows in organizations [69,76]. Nevertheless, this is an area that still needs to be examined deeply in a PSO context.

5.8. Institutional, Environmental, Socioeconomic and Political Contexts

Institutional framework is the terminology used by Lozano [30] and Domingues et al. [37] as a dimension in their conceptualizations of organizational sustainability in PSOs. Although this aspect was not clearly highlighted in this study, it is nevertheless important to acknowledge that PSOs are embedded in larger contexts that have impacts on the various areas of sustainability and CE in public administration. Therefore, these various contexts around a PSO include the institutional context of local, national, and international policies and regulations; the environmental context; the socioeconomic context of the country, region, or locality with its economy and demography; and finally, the political and cultural context. Studies in public sector change management have for instance recommended to "devote more attention to the research of contextual factors influencing the effectiveness and appropriateness of different approaches to change. A possible direction for future research could be the influence of the complex and political environment of public organizations" [96] (p. 380).

6. Conclusions

The implementation of CE principles by organizations has the potential to accelerate the transition towards sustainability in order to go beyond current sustainable development efforts [20]. Given the significance and potential of the public sector in the CE transition and taking into account the organizational specificity of the public sector, it is imperative that PSOs integrate CE principles into the sustainable management of their resources at the organizational level. Consequently, this paper takes an organizational sustainability approach to provide the first review of the state of current research on the engagement of PSOs in CE practices and strategies. Organizational sustainability entails the continuous integration of sustainability issues into an organization's system elements, in various dimensions or areas of an organization [30]. The results of this literature review indicated that the research on CE practices and strategies in PSOs has focused so far only on certain areas of PSOs, mainly covering the areas of PP, internal operations and processes, and public service delivery. This review also demonstrated that the CE-related practices and strategies identified are mainly incremental in scope and targeted towards improving energy and resource efficiency, increasing product-life extension and recycling, and reducing waste generation and emissions. The current literature therefore advocates more transformational practices and strategies that encourage the development and change of behaviors, the redesign of current unsustainable processes, and the creation of alternative operational processes and strategic considerations in line with CE ideas. Elements such as collaboration, information exchange between stakeholders, and awareness raising bringing new knowledge and skills were consistently highlighted by the current literature as crucial issues to include during the implementation process of CE practices and strategies in PSOs, encouraging a transformative and substantial shift towards circularity.

Based on the results of this integrative literature review and by using the theoretical base of organizational sustainability and applying it to the context of CE and the public sector, this paper also presents an organizational CE framework of PSOs that will direct further research by providing a holistic and systemic view of the potentiality of integration of CE practices and strategies into PSOs. This framework conceptualized a PSO as a system for which the areas of PP, strategy and management, internal processes and operations, assessment and communication, public service delivery, human resources dimensions, collaboration with other organizations, and the influence of various external contexts are essential interrelated areas to consider in the implementation process of CE at the organizational level in the public sector. The framework highlights opportunities for further research to better understand the integration process and thus to accelerate the implementation of CE in PSOs. With this framework in mind, future studies can contribute to the identification of the level,

pace, and forms of engagement in CE practices and strategies of PSOs of different levels (national, regional, and local) and of different types through the examination of specific cases to assess their contribution to the CE transition. Further research is also suggested to focus on a specific area of PSOs and explore how CE is practiced in these dimensions of PSOs. It is also necessary to investigate the different types of barriers and drivers pertaining to the different parts of the framework to incorporate CE practices and strategies in PSOs.

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