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Circular economy in green public procurement procedures: an intermediation perspective in the Italian setting

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Abstract: The concept of circular public procurement has been developed as an approach that extends the green public procurement one, recognising the relevance of circular economy-related dimensions in green public procurement procedures, such as resource reuse and efficiency. This notwithstanding, the circular economy criteria are not made completely explicit in the current green public procurement procedures in the Italian setting. To grasp how a more circular economy can be promoted in Italian green public procurement procedures, the case study of Consip, the major centralised purchasing centre for the most relevant public tenders and supplies in Italy, was conducted. Through a content analysis on secondary sources of information and interviews with experts involved in these procedures, the paper highlights the role played by intermediaries to support supplier companies to establish a relationship with major public purchasing centres and to overcome potential barriers when deciding to approach a green public procurement procedure.

Keywords: circular economy; green public procurement; circular public procurement; sustainability; intermediation; Italian setting; case study.

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1 Introduction

Public procurement (PP) can be referred to the process by which public authorities, such as central government departments, regional, and local authorities or bodies governed by public law, purchase works, goods, or services from companies (European Commission, 2017; Hong and Kwon, 2012). Consequently, green procurement (GP) or green public procurement (GPP) can be defined as the legal framework to promote the integration of sustainable, social and environmental objectives in public tenders and contracts (Diófási and Valkó, 2014; Nikolaou and Loizou, 2015). During the last decades, governments authorities (mainly from the EU and USA) have promoted and issued environmental policy instruments aimed at stimulating or even imposing green behaviour on both companies and consumers (Dubey et al., 2013; Kaufman, 2014; Rainville, 2017; Simcoe and Toffel, 2014; McMurray et al., 2014).

The implementation of PP in relation with the objectives to reduce the environmental impact, as well as the negative social externalities of works, goods, or services provided by companies, could represent a major driver in pushing the supply market to develop new sustainability-oriented products and services, thus reducing negative social and environmental externalities, and improving the diffusion of sustainable and circular economy approaches (Cheng et al., 2018). The large volumes and value of public contracts, if addressed to sustainable products, services, and processes, may represent a strong incentive for suppliers to comply and, therefore, they should be encouraged to design and manufacture eco-efficient products and services, stimulating research and technological innovation.

However, many studies converge on an actual poor application of GPP procedures, due to the difficulties related to the lack of clarity of the environmental criteria (Michelsen and de Boer, 2009; Testa et al., 2012; Nissinen et al., 2009), the usage of

generic criteria that prevent the verification by the contracting authority for their compliance (Fuentes-Bargues et al., 2017), the fact that there is still a lack of environmental criteria in the evaluation of tenders and poor influence on the final awarding decision (Varnäs et al., 2009; Fuentes-Bargues et al., 2018). In addition to that, GPP criteria are perceived as:

1 complex
2 difficult to be implemented in public tenders
3 requiring technical expertise in their application
4 complicated to monitor in the execution of contracts.

These issues concerning GPP have become even more interesting to address from the point of view of the circular economy, an industrial approach that calls for improving resource efficiency by prolonging the value of products or services within supply chains markets (Alhola et al., 2019). Within this context, the concept of circular public procurement (CPP) has developed as an approach to greening procurement that recognises the role that public authorities can play in supporting the transition towards a circular economy (Sönnichsen and Clement, 2020).

Starting from the premise above, our research investigates how a more circular economy can be promoted in GPP procedures, which will be hopefully able to address social and environmental targets. To address this objective, the paper conducts an analysis on secondary data related with GPP procedures operated by the Consip, the major centralised purchasing centre for all Italian public bodies and institutions. After this preliminary analysis, a set of key respondents – e.g., government employees, consultants, employers' associations – involved as intermediaries in these GPP purchasing procedures have been interviewed, with the aim to grasp the current state of GPP in Italy and the future actions to be tackled for further promoting a more circular economy in public procurement.

From a theoretical perspective, our research contributes to advance knowledge in the studies about GPP by showing potential barriers that must be overcome by supplier companies when deciding to approach a GPP initiative. In doing so, our paper shows the role played by intermediaries in supporting these companies to establish a relationship with major public purchasing centres, as in the case of Consip. From a managerial perspective, our research informs intermediaries about the levers they may exploit to facilitate supplier companies to advance towards a more CPP, and especially in the Italian context.

The paper is structured as follows. After the introduction, Section 2 reviews the literature at the intersection between circular economy and public procurement to highlight the main research gap and question of this study. Then, while Section 3 provides the rationale of the methodology, Section 4 highlights the main results. Finally, Section 5 discusses the results against the existing research and Section 6 points out the concluding remarks, together with the main limitations and avenues for future research.

2 Literature review

PP is the process by which public authorities, such as central government departments, regional, and local authorities or bodies governed by public law, purchase works, goods,

or services from companies (European Commission, 2017). Related with the concept of PP, the one of GPP has gained high political priority and is argued to be an effective demand-side policy to trigger environmental innovations (Krieger and Zipperer, 2022; Walker and Phillips, 2009), such as circular-oriented ones (Ntsonde and Aggeri, 2021), and further a more sustainable development (Testa et al., 2012). The academic literature points out how the GPP is a vital sustainable development tool (Zhu et al., 2013), and a stream of literature has analysed the actual adoption of GPP practices among contracting public administrations (e.g., Nikolaou and Loizou, 2015; Kaufman, 2014; Luttenberger and Luttenberger, 2017; Leal Filho et al., 2019), as well as the existence of environmental criteria within the tenders (Parikka-Alhola, 2008; Testa et al., 2016). Some authors have focused on evaluating sustainability reports and websites of entities involved in the procurement process, employing content analysis as a research methodology (Pacheco-Blanco and Bastante-Ceca, 2016; Mansi, 2015; Michelsen and de Boer, 2009).

Building on the concepts of PP and GPP, the one of CPP gained prominence among policymakers; it represents the approach to greening procurement which recognises the role that public authorities can play in supporting the transition towards a circular economy (Kirchherr et al., 2023). Circular economy is a novel industrial approach that has been introduced to overcome the issues characterising the traditional linear 'take-make-dispose' economic model, which has shone in the conditions of resource abundance, but has more recently reached the limit for supplying the input the mankind needs for sustenance in the economic and demographic trends (Sariatli, 2017). Circular economy aims to overcome traditional systems of production and resources consumption, by encompassing some sustainability approaches, such as regenerative design, performance economy, cradle-to-cradle (C2C), industrial ecology, biomimicry, cleaner production, and blue economy (Ünal et al., 2019; Geissdoerfer et al., 2017). Accordingly, CPP can be defined 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, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across their whole life cycle (European Commission, 2017).

Notwithstanding the potential of CPP to create opportunities for innovative practices and new markets through valuation processes, the circular economy criteria are not made completely explicit within the current GPP procedures, and this issue slows down the development and growth of a CPP framework (Qazi and Appolloni, 2022).

Into this research context, especially, literature has not deeply investigated the dynamics of intermediation for how to facilitate public procurement, including projects for a more circular economy (Rainville, 2021). Intermediation regards consultations of external groups, including potential suppliers, other government agencies, and experts through which to support knowledge dissemination and improve procurement outcomes. Edler and Yeow (2016) discuss intermediation as what can "establish or enable the link between different actors with complementary skill sets or interests" (p.414), focusing on roles of multiple intermediaries in supporting 'the generation and diffusion of innovation' (p.414) through public procurement. Therefore, given intermediation is recognised to facilitate such consultation processes in public procurement (Edler and Yeow, 2016), it should also be exploited for facilitating public procurement, including projects for a more circular economy.

However, literature still falls short to deeply investigate the dynamics of intermediation for how to facilitate CPP (Vanacore et al., 2023). Starting from the above

premise, in this paper we address the research gap highlighted by Rainville (2021) about how the roles and dynamics of intermediation may promote a more circular economy through PP and GPP.

3 Research design

The research design of this study relies on a case study approach (Yin, 2018), according to which several methods and empirical sources contribute to offer a holistic understanding of the phenomenon of interest (Eisenhardt, 1989). Due to the mandatory publicity and great availability of information about Italian GPP procedures, we started with the collection and analysis of secondary data (Reddy and Agrawal, 2012), especially related with GPP procedures operated by the Consip, the centralised purchasing captive company (fully owned by the Italian Government) for all Italian public bodies and institutions. After this phase, ten key respondents involved as intermediaries in these GPP purchasing procedures have been interviewed.

3.1 Collection and analysis of data from secondary sources

To collect information on the set of actions and criteria to support sustainable purchasing procedures, we conducted archival research of available data, mainly based on publicly available procedures of Consip Company, to date the most significant example in Italy of GPP implementation. Consip operates as a centralised procurement centre for all Italian public agencies and institutions, with a total of 8.5 billion euros of tenders called in 2021 and about 6 billion euros awarded so far. Consip "analyses the supply market and develops tenders that cover the needs of public administrations, while providing consulting services and expertise, as well as developing and administering the public e-procurement platform" (source, web portal). As reflected in the company's sustainability reports (materiality matrix analysis), purchasing procedures are developed with attention to the environmental, social, and economic dimensions of triple bottom line (TBL), and they are currently evolving towards purchasing procedures that increasingly incorporate the circular economy approach. Indeed, this approach is considered one of the 12 priorities of Consip's materiality matrix.

Table 1 Clusters for the products/services of purchasing procedures

Cluster	*Product/service category*	*Number of purchasing procedures and/or summary sheets*
1	Information and communications technologies (ICT)	10
2	Motor vehicles	3
3	Energy	5
4	Facility Management	5
5	Meal vouchers	2
6	Office equipment	1
7	Job security	1
8	Business transfers	1

To understand the main aspects of sustainability and circular economy embedded in the GPP procedures managed by Consip, 28 purchasing procedures found in the 'green purchasing' section of the web portal managed by Consip were considered. The 28 purchasing procedures are related to the 'Program for Rationalization of Procurement in Public Administration'. The procurement procedures are currently active and are reported through 28 summary sheets.

These summary sheets may belong to different clusters of purchasing procedures. Eight clusters were especially identified based on the products/services required and the different product/service areas reported on the web portal.

The summary sheets were all read in full. To reconstruct the current state of sustainable and CPP in Italy, and to obtain an overview of the structure of the purchasing procedures reported in the web portal, we deeply analysed two clusters, each one containing the major number of summary sheets and each one focusing on purchasing processes for products and services, respectively. The selected clusters, i.e., cluster 1 – information and communications technologies (ICT), and cluster 4 – facility management, include 15 of the 28 summary sheets.

Microsoft Excel was used for data collection and to structure the qualitative dataset to perform a content analysis. The following attributes were reported in each summary sheet:

1 *Supply object* (attribute 1): it refers to the object of supply (as detailed in Tables 7 and 8 in the results section).

2 *Sustainable areas* (attribute 2): they are the areas of application of sustainable procurement processes (as in Table 2).

Table 2 The four sustainable areas identified

#	*Sustainable areas*
1	Sustainable use of resources
2	Sustainable resource management
3	Health and safety
4	Waste management

3 *Sustainable factors* (attribute 3): they are the subcategories of sustainable areas and refer to the characteristics and specifications for the specific purchasing procedure. These factors are shown for the two clusters in Tables 3 and 4.

Table 3 Sustainable factors for the cluster 1

#	*Sustainable factors*
1	Consumption of resources
2	Collection and disposal
3	Noise
4	Weight and dimensions
5	Emissions
6	Protection of workers
7	Dangerous substances
8	Ergonomics
9	Electromagnetic fields

Table 4 Sustainable factors for the cluster 4

#	*Sustainable factors*
1	Consumption of resources
2	Monitoring and control
3	Non-standard means, equipment, and materials
4	Training of employees
5	Cleaning service
6	Collection and disposal
7	Gardening service
8	Green maintenance service
9	Staff uniforms
10	Soil protection
11	Technical registry
12	Collection and sorting of special waste
13	Disinfestation services
14	Hazardous substances
15	Worker protection

4 *Type of key performance indicator (KPI)* (attribute 4) for the purchasing procedures: defining criteria and methods of supply selection.

5 *Circular economy links* (attribute 5): a keyword is associated with the circular economy practices (e.g., recovery, recycling, design, etc.). These keywords, shown in Table 5, were identified based on literature deemed relevant to circular economy practices and principles (e.g., frameworks from the Ellen MacArthur Foundation, 2013).

Table 5 Keywords for the circular economy

#	*Keywords for the circular economy*
1	Reduction
2	Recycling
3	Eco-design
4	Maintenance
5	Recovery
6	Regenerate
7	EPR (Extended Responsibility Producer)

6 *KPI level* (attribute 6): it defines baseline and additional scores for various purchasing procedures.

Keywords were developed for each attribute. The attributes' specifications in the tables above were particularly used as keywords for the analysis. These keywords, therefore, were developed considering both the content of the evaluated initiatives (e.g., tables, charts, etc.) and the principles of sustainability. The absolute frequency of each keyword (i.e., the number of times the keyword appears in the dataset), made it possible to

extrapolate useful information for the research objective. The attributes identified are applicable to the full set of initiatives considered, as they are developed from the sustainable aspects and requirements of each product/service category.

3.2 Interviews with key respondents

After the collection and analysis of secondary data, which were necessary to understand the main aspects of sustainability and circular economy embedded in the Italian GPP procedures managed by Consip, ten key respondents involved as intermediaries in these GPP purchasing procedures have been interviewed. To all the respondents, official requests for interviews were sent individually via e-mail, with a brief follow-up email one week after if no response was received. The interviews took place between December 2022 and January 2023. Respondent names were anonymised to encourage greater openness in responses, and then reviewed the findings presented in Section 4 to ensure accuracy and completeness. Using a semi-structured interview protocol, questions were open-ended to solicit a multiplicity of responses from respondents. As part of this method (Campbell et al., 2013), sub-questions were asked depending on the depth and content of interviewee response. The questions helped to capture aspects of interactions, including their nature and frequency, drivers for change, barriers to change, facilitators, and suggestions for improvement. Interviews lasted an average of 60 minutes and a half, totalling more than 15 hours of interviews.

The main questions characterising the interview protocol are provided hereafter:

1 Could you briefly present yourselves and your involvement within the Italian GPP procedures, and especially within those managed by Consip?

2 How do Consip and supplier companies interact each other? Which is your role as intermediary in this interaction?

3 Do you stimulate a discussion about sustainability and circular economy aspects while Consip and supplier companies interact each other?

4 Which are the mains issues in promoting the circular economy aspects within the Italian GPP procedures? Which are those within the GPP procedures managed by Consip?

5 In which way the discussion about sustainability and circular economy aspects should be further facilitated within the Italian GPP procedures?

6 How could circular economy aspects be operationalised in the Italian GPP procedures?

Table 6 shows the profile of the key respondents involved in the interview process, and the affiliation, i.e., one from a Chamber of Commerce, seven from different employers' associations (Confartigianato Imprese, Confapi, Confindustria, Ance, Confesercenti, and Confcooperative), one from Consip itself, one from a consulting firm (Lapam).

Table 6 Respondents' profile

#	*Key respondent*	*Affiliation*
1	Head of environmental office	Chamber of Commerce
2	Employee	Confartigianato Imprese
3	Head of legal affairs	Confapi
4	Head of economic, fund, and incentives office	Confindustria
5	Employee	Confcooperative
6	Expert of environmental sustainability in the public procurement procedures	Consip
7	Director	Confcooperative
8	Public procurement and environment officer	Ance
9	Compliance manager	Lapam
10	Employee at development and start-up office	Confesercenti

4 Results

Quantitative and qualitative results are given in the following section. Before presenting the results, in Tables 7 and 8, the 15 procurement procedures have been distinguished according to the object of supply (attribute 1) and their type.

Table 7 Object and type of purchasing procedures for the cluster 1 (ICT)

#	*Supply object*	*Product/service*
1	Outsourced desktop equipment	Product
2	Multifunctional equipment for rent-27	Service
3	Multifunctional equipment for rent-28	Service
4	Telephone exchanges	Product
5	Outsourced contact centre services	Service
6	PC desktop	Product
7	LAN (Local Area Networks)	Product
8	Server	Product
9	Printers	Product
10	Mobile connection	Service

Table 8 Object and type of purchasing procedures for the cluster 4 (facility management)

#	Supply object	Product/service
1	Facility management	Service
2	Facility management for cultural heritage	Service
3	Cleaning services for national health system	Service
4	Cleaning and other services for schools and training centres	Service
5	Services for barracks	Service

As far as the procurements in the facility management cluster are concerned, all considered types relate to the type of services.

4.1 Results for cluster 1 (ICT)

The sustainable areas (attribute 2) for cluster 1 are listed below:

1 sustainable use of resources

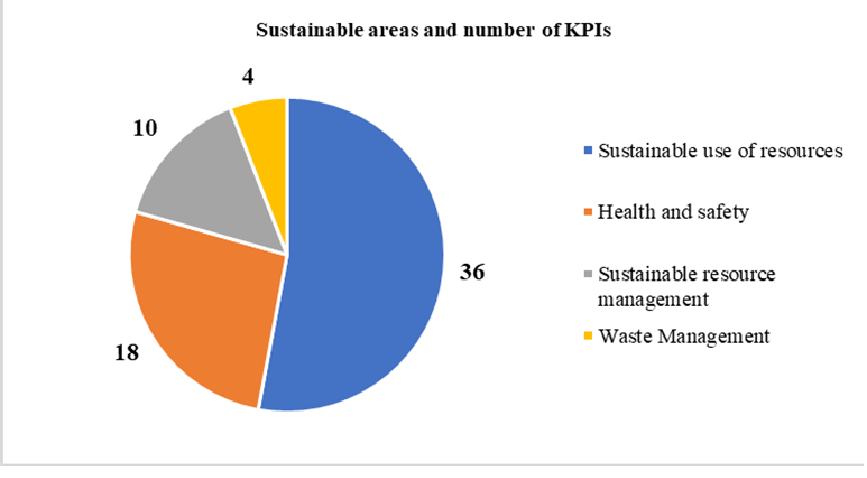
2 sustainable resource management

3 health and safety

4 waste management.

A total of 68 key performance indicators (KPIs) were found. The extent of the four sustainable areas based on the number of KPIs belonging to each area is shown in the pie chart.

Figure 1 Sustainable areas and number of KPIs for cluster 1 (see online version for colours)



Based on the information reported in the summary sheets, two different types of KPIs were collected (attribute 5). The number of KPIs, broken down by type, is shown in Table 9.

Table 9 Number and type of KPIs

Type of KPIs	*Number of KPIs*
Qualitative	34
Quantitative	34

Quantitative KPIs can be further divided into two types:

1 Quantitative KPIs with a maximum and minimum value: the criterion, or type of sustainable intervention, is specified with respect to a maximum or minimum value. In this way, a range of values can be identified within which to implement the required criteria and interventions. For this typology, 24 KPIs were identified.

2 Quantitative KPIs with defined value: the value required for the KPI is specified. For this type, 10 KPIs have been identified.

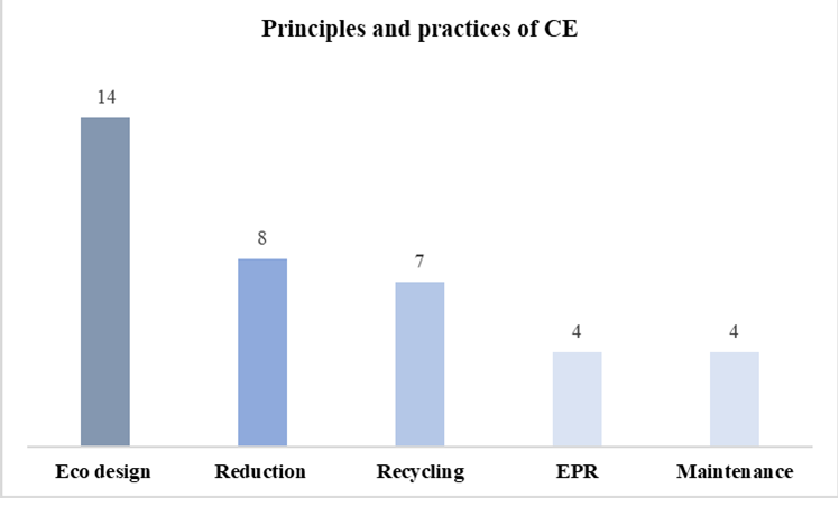
According to attribute 6, KPIs can be divided into:

1 Basic KPIs: these are the minimum criteria required for public procurement (PP). For this typology 38 KPIs were identified.

2 Rewarding KPIs: these are the criteria for which additional scoring is provided. For this type, 30 KPIs were identified.

Several keywords have been developed for circular economy principles and practices, as described earlier in Section 3, and the absolute frequency of each is depicted in Figure 2.

Figure 2 Principles and practices of CE for cluster 1 (see online version for colours)



The sum of the absolute frequencies of the four keywords is 37. Therefore, the link with circular economy and ICT delivery initiatives is not weak: indeed, 54.41% of the identified performance indicators consider the principles and practices of the circular economy approach.

The frequency of eco-design is the highest. Table 10 shows the breakdown of the 14 KPIs according to attributes 4 and 6.

Table 10 Type and level of circular design KPIs

	Qualitative KPIs	*Quantitative KPIs*	*TOT.*
Basic KPIs	6	4	10
Rewarding KPIs	1	3	4
TOT.	7	7	14

The first six basic KPIs are qualitative and refer to the optimisation of resource consumption. These criteria consider, for example, server requirements, appropriate valves in electronic equipment, duplex mode in printers, appropriate specifications for inspection and maintenance activities, and design for dematerialisation through remote system management.

The four basic KPIs are quantitative and specify the server's quantitative requirements, weight, volume, and packaging characteristics.

The only qualitative rewarding KPI concerns the absence of plastic materials. Two of three quantitative KPIs concern weight and easy identification of plastic and metal parts for easy disassembly.

Table 11 shows the results for the reduction principle.

Table 11 Type and level of circular KPIs for reduction

	Qualitative KPIs	*Quantitative KPIs*	*TOT.*
Basic KPIs	1	0	1
Rewarding KPIs	2	5	7
TOT.	3	5	8

Initiatives focus on efficient resource consumption in terms of reducing equipment energy consumption and energy absorption.

The recycling principle includes 7 KPIs divided as shown in Table 12.

Table 12 Type and level of circular KPIs for recycling

	Qualitative KPIs	*Quantitative KPIs*	*TOT.*
Basic KPIs	0	4	4
Rewarding KPIs	1	2	3
TOT.	1	6	7

The basic KPIs refer to the use of recycled paper and recycled materials to make the packaging. Rewarding criteria also consider the percentage of recycled plastics and the use of recyclable polymers.

The last eight KPIs are equally divided according to the principle of ERP and maintenance.

Table 13 Type and level of circular KPIs for ERP

	Qualitative KPIs	*Quantitative KPIs*	*TOT.*
Basic KPIs	3	0	3
Rewarding KPIs	1	0	1
TOT.	4	0	4

ERP criteria refer to the collection, disposal of old electrical and electronic equipment. The criteria for telephone exchanges are basic, while in other cases (e.g., printers) the requirements are rewarding.

Table 14 shows the KPIs of maintenance.

Table 14 Type and level of circular KPIs for maintenance

	Qualitative KPIs	*Quantitative KPIs*	*TOT.*
Basic KPIs	2	0	2
Rewarding KPIs	2	0	2
TOT.	4	0	4

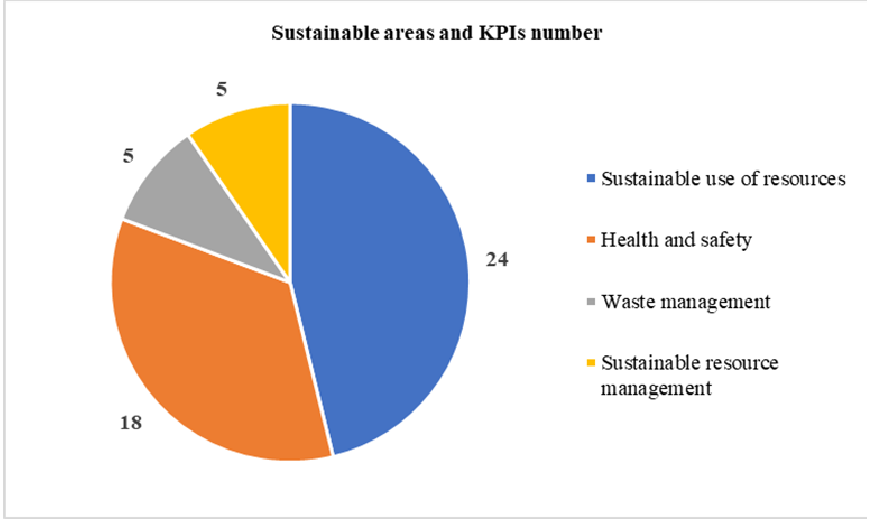
Basic and rewarding intervention types include remote management and diagnostic services through which maintenance can be performed remotely and pre-fault events can be detected.

These results are reported in the summary sheets analysed. However, it is necessary to consider additional requirements that are mentioned in the sheets and will most likely be elaborated in further documentation, such as technical specifications and minimum environmental criteria (MEC).

4.2 Results for cluster 4 (facility management)

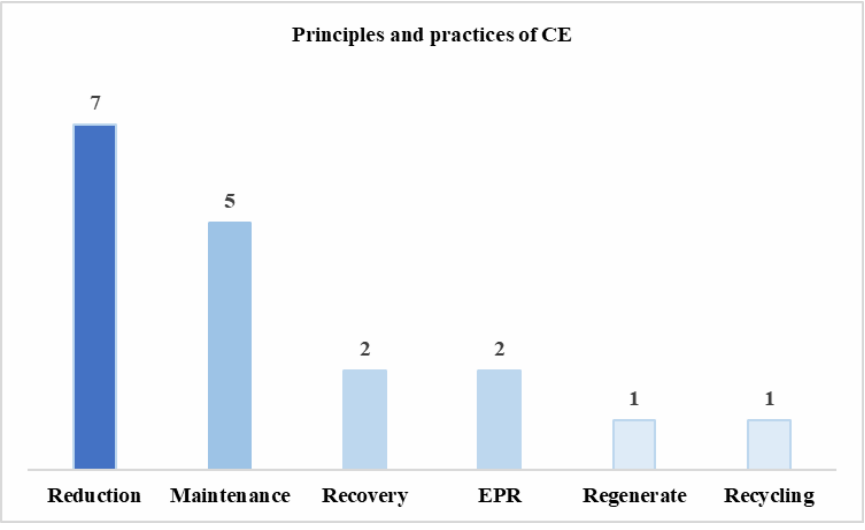
As with the previous cluster, this section analyses the results of cluster 4. The same sustainable areas were identified for cluster 4, and the breakdown of the 52 qualitative KPIs analysed is shown in the pie chart. For this cluster, only two summary sheets specify the distinction between basic and reward criteria. Therefore, it is not possible to provide a complete view of this attribute, which is why the results are not reported.

Figure 3 Sustainable areas and number of KPIs for cluster 4 (see online version for colours)



The histogram shows the values of absolute frequencies found for circular economy principles and practices.

Figure 4 Principles and practices of circular economy (see online version for colours)



For purchasing procedures belonging to this cluster, the keywords identified are six and, among the qualitative KPIs, only 34.62% consider circular economy principles. Thus, for this cluster, the link between green procurement process and circular economy is weak.

Purchasing procedures for the reduction principle focus on the efficient use of resources in terms of:

1 establishing environmental management measures to minimise the consumption of energy, water, electricity, and the extraction of non-renewable materials through training

2 use of materials by trying to favour the use of products made from environmentally friendly fabrics, sustainable fibres, and environmentally friendly detergents in order to reduce the use of hazardous substances

3 implementation of monitoring and control systems through the use of detection tools for remote management of major energy loads to calibrate and reduce consumption and prepare an equipment status report.

KPIs for maintenance practices consider the following aspects:

1 creating technical documentation to carry out planned interventions and manage maintenance activities

2 using monitoring and control systems to carry out resource efficiency interventions

3 define routine and extraordinary maintenance activities to ensure the performance of vehicles, equipment, and materials.

Recovery KPIs consider waste management, with a focus on the recovery of electrical and electronic equipment and the recovery of hazardous and non-hazardous special waste.

The last two criteria refer to the use of renewable materials to promote ecosystem regeneration and conservation. Finally, the last criterion relates to the recycling of organic matter.

4.3 Interview results

Ten interviews were conducted. Only one respondent has managed Consip's GPP. The other respondents are Consip intermediaries. They support supplier companies to define products and services for Consip's GPP. The results of the interviews show the role played by the intermediaries to reduce the number of potential barriers that supplier companies may encounter when deciding to approach a GPP procedure.

Table 15 shows the set of potential barriers on which the key respondents paid most of the attention during the interview process.

Table 15 Types of barriers and related aspects

#	*Type of barrier*	*Main aspects*
1	Competence	• Principles and practices of circular economy
		• Skills to implement practices of circular economy
2	Economic dimension	• Size and resource issues
		• Application of lowest price criteria
		• 'Benefits' of the linear economic model
3	Technology and infrastructure	• Substitutions needed for CPP
		• Lack of conditions to develop circular supply chain
4	Organisational perspective	• Seniority and the number of people
		• Priority management
		• Bureaucratic aspects
		• Lack of communication and a multidisciplinary approach
5	Strategy	• Exclusion of possible contractors
		• Missing market
		• Failure to assess the impacts and benefits
		• No communication about circular products and services offered by contractors
6	Regulatory system	• Absence of knowledge about the circular economy regulatory system
		• Different skills are needed to analyse and interpret data and regulatory standards
7	KPI's design and control design	• Lack of control
		• Very complex requirements under current regulations

Competence is the first barrier identified by the respondents. Company and public administrations (PAs) do not have the competences and skills to put in practice circular economy principles. Interviewee 1 explains the reason, "it is complicated to talk about circular economy principles to business and PAs, they are inexperienced with circular economy practices. Many companies still consider as waste, materials that can still be

(re)used". According to three interviewees, to be able to offer or request circular services or product t is necessary to have the right technical skills because, as interviewee 6 says, "environmental issues are very technical". Interviewee 8 emphasises that the problem is not the supply but the demand indeed, "PAs believe that circular product, or more generally circular materials, do not performance as well as those obtainable from linear manufacturing processes". Even some intermediaries (2 out of 10) are not familiar with circular economy solutions for services sector, indeed, as interviewee 10 says, "I think that these issues are more about the provision of product than services". The first step in supporting the development of CPP is to eliminate the information gap of contracting authorities and contractors on circular economy issue. The training process must consider technical, regulatory and legal aspects on circular economy practices and principles as interviewee 6 explains, "through sending out questionnaires and meetings with suppliers and who develop tender strategy, we seek to generate opportunities for discussion about sustainability and the circular economy that include the topic of possession of process certifications and/or eco-labels, proposals that enhance the circular economy, environmentally sustainable primary and secondary packaging, etc. However, there is also a need for intermediaries to specialize more on these issues", indeed "sustainability and innovation are closely related concepts, and we are preparing to offer personalized counselling" (interviewee 9). Barrier analysis highlights the need to develop a systemic and systematic view. The intermediaries enable the collaboration among different people involved that is necessary for this purpose, as interviewee 7 explains, "we have organized webinars on sustainability and the circular economy by inviting speakers, particularly on certain areas such as waste collection for the dissemination of best practices".

The *economic dimension* is the second barrier identified by the interviewees. Several times during the interviews the interviewees stress the need to increase the PA's budget available to implement CPP. As interviewee 1 says, "using materials or product derived from circular economy practices have higher price" and this happens because, "in order to be able to offer circular economy product or services it is necessary to acquire certifications and, in some cases, even to convert the production plant and these activities have impact on the product price" (interviewee 9), but "the PA's budget is always contracting" (interviewee 2). In this regard, a concrete example is provided by interviewee 8 who also supports construction enterprises, interviewee 8 explains, "if we consider the standard cost of building, this cost is lower than the cost of building with higher environmental and energy performances so, if you want higher performances, you have to increase the budget otherwise it would not easy, for our contractors to implement circular economy solutions at the best price considering the costs incurred". As reported by a couple of interviewees, "there is also size problem because small businesses often do not possess the human and financial resources to redesign products and operations in order to apply the principles and practices of the circular economy" (interviewee 9), but "large organizational entities have more resources, they are prepared to address, and they are ready to manage these issues and to implement circular practices" (interviewee 10). In addition, another consideration for the economic dimension concerns the application of criteria to decide the winning contractor indeed as a respondent says, "the dominant criterion for awarding the contract is not the most economically advantageous (which can weight also other factors then price) tender criterion but it is the lowest price (which consider only the price of the supply)" (interviewee 1). Interviewee 8 say in this regard, "the goal of contractors is providing the service/product at the lowest cost, so if the

logistic cost of recycled aggregate is high, they are automatically excluded from PP". As emerges from the interviews, "anything that incorporates the element of reward in public procurement is welcome" (interviewee 5). For solving problems related to the economic dimension, especially for small and medium enterprises (SMEs), which do not have sufficient financial resources, interviewee 4 explains, "for there to be a shift toward CPP it is necessary to provide the financial resources, such as capital grants, to enable small companies to adapt their structures, for conversion of the production system or their organizational assets for the execution of the contract" (interviewee 5) and, "several funders are interested in environmentally responsible sectors" (interviewee 3). Interviewee 2 explains that "circular contractors could be rewarded through increased visibility on the portal in order to improve the positioning and communication of their circular services and products" indeed "one of the goals of contractors is to communicate their presence through realization of public works". Again, the figure of the intermediary is crucial for the development of CPP as interview 7 explains, "as intermediaries we can and must inform the companies that we provide them a support about the possible drivers related to green issues, because precisely, we need to incentivize the transition in the public works market as well. However, we also need more knowledge about all the alternatives that can incentivize this change". In this regard, interviewee 8 states, "as intermediaries, we also incentivize green and circular purchasing procedures, such as selecting the circular supplier in the area for those we support". In addition, two of the respondents stress the need for stricter regulation. Interviewee 5 indeed says, "in my opinion, as drastic as this observation is, CPP will be implemented when companies will understand the importance of the sustainability. Creating tax, such as pollution tax, could be a solution". Finally, interviewee 4 states that "there should be stricter laws which push PAs to supply from sustainable companies and disincentivize supply from unsustainable companies". The last problem related to the economic dimension is the economic benefit from linear economic model, as interviewee 9 explains, "the circular economy model is still perceived as less profitable than the linear economic model, indeed, especially when the quantity is small, organizations prefer to dispose of the material instead of recovering it" but "the world is changing" (interviewee 1) and "there are two macro business trends to consider: digital innovation and sustainability" (interviewee 9). As reported by two intermediaries, today, there are two reasons why it is necessary to support the transition to CPP:

1 "CPP is a business opportunity for both PAs and businesses, it is a profitable opportunity and a chance for growth" (interviewee 7)

2 "environmental issues affect all businesses and enterprises that intermediaries support" (interviewee 8).

As explained by interviewee 5, "PAs need to understand that the availability of raw materials is not the same as in the past years. For example, many gases can no longer be found commercially and, if they can be found, their price is gradually increasing according to the law of supply and demand. CPP can certainly help resolve this issue". Instead, as interviewee 3 reports, "in my opinion, the possible solutions offered by CPP are effective. As of today, indeed, the "world of reuse" is gaining importance especially after the increase in energy prices". Interviewee 9 also points out the opportunities of CPP for the last stage of the product life cycle, "waste disposal costs will continue to rise; CPP allows these costs to be mitigated because waste is considered a resource to be sold

to specialized entities". According to interviewees, "the development of CPP represents a shift from current trends" (interviewee 7) however "about digital innovation we are slightly ahead, on sustainability and circular economy there is still much to be done, especially for PAs" (interviewee 9). In addition, two of interviewees emphasise that the circular economy practices and principles have already been implemented in Italy, "in 1980, some raw materials were scares and it was necessary to recover or recycle" and to this day there are several products still in use "such as kitchens made by reusing wood" (interviewee 1).

The lack of *technology and infrastructure* is the third barrier identified by the respondents. As mentioned by interviewee 5, to date, the technology does not exist to implement circular economy principles and practices, "the development of CPP is hindered by lack of technology indeed it is not possible to recycle everything such as soils and excavated rocks". As interviewee 8 says, "in some cases there is a design problem for disassembly caused by impurities in the products" and this statement is also supported by interviewee 1 who say, "we need technology to separate polluting components such as paints and glues if we want to apply industrial symbiosis practices to reuse wood waste otherwise, we cannot implement CPP". In addition, "to implement the practices of industrial symbiosis in CPP there is a need to study the network, infrastructure and local conditions" (interviewee 9). Along technological barriers the infrastructure barriers are another obstacle to the implementation of CPP as interviewee 5 says, "to use electric transport we need take into consideration the issues related to timing such as the downtime due to vehicle charging and the lack of charging stations". In some cases, "businesses are not technologically ready but in other cases the supply chain is missing" (interviewee 9). In this regard, interviewee 8 describes the problem related to drywall, "drywall recovery plants are found only in central Italy. For this reason, it is not convenient to recover it".

The *organisational perspective* is the fourth barrier identified by the experts. As the respondents revealed, "today it is a legal obligation to use a platform for PP, and PAs use Consip's platform because it is free. However, if PAs find a more advantageous offer on equal terms, it is possible not to use the platform" (interviewee 1). For this reason, before paying attention to the design and development of CPP, critical organisational issues need to be managed. The first problem is related to seniority and the number of people of the PAs. Interviewee 3 says, "Consip's platform is not very intuitive for who are not technology experts", for this reason "a key obstacle to overcome concerns the use of the platform" (interviewee 5). In addition, "the human resources employed in PAs are few and very often they are unable interpret regulations. This issue hampers the development of CPP" (interviewee 6). Indeed, experts identify the bureaucratic problems as another problem in the development of CPP. Interviewee 9 says, "I think that long bureaucratic time is needed to check compliance with circular requirements, certifications, criteria, etc.", and "Italian enterprises and companies are intolerant of bureaucracy" (interviewee 5). To resolve these barriers, intermediaries support companies "in registering to the platform and creating the catalog of products and services and after several procedures enterprise become autonomous in using it" (interviewee 2). Only one intermediary states, "to support the management of the purchasing procedures and reading technical specifications, different backgrounds are needed for different product and service categories" indeed "there is also a need for intermediaries to specialize" (interviewee 6). The second problem related to the organisational perspective is inherent to "priority

management". In PAs, there is a single project manager (SPM) who has strong administrative skills to manage and implement all the legislative requirements found of the procurement code, but as interviewee 8 explains, "the priority objective of SPM is to meet the deadlines imposed by regulatory no special design skills are required for this role". In this regard interviewee 1 says, "the development of CPP requires that the SPM's design skills are as important as his administrative skills". The last critical issues related to organisational perspective concerns the lack of communication between experts as interviewee 8 explains, "there is not a multidisciplinary approach in fact during the interaction with the municipality; the feedback received was that the environment office was never involved in the preparation of the PP. Communication is needed those who manage financial economic resources and those who manage maintenance plans". In this regard, most experts do not solve these problems because they do not "manage the purchasing process" (interviewee 3).

The *strategy* is the fifth barrier identified by the interviewees. One of PA's goals is for the public work to be done correctly and on time and they must ensure that all possible contractors can participate in the PP. As interviewee 1 says, "CPP would result in the exclusion of many participants". According to interviewee 2, to date, CPP is not developed because "the "triggering factor" is missing, i.e., the market", and if there is no demand from PAs or "if they do not require it in quantities to justify a change in the production process, contractors are not investing in the development of circular solutions" (interviewee 9). At the same time businesses have no interest in the research and development of circular solutions, indeed as interviewee 1 states, "manufacturers sometimes do not respect restrictions, e.g., plastic bags' tax or detergent bottles' tax), they prefer to pay the tax because they do not want to exit the market and they do not take into account the bad reputation that this action can generate" (interviewee 1). These statements are confirmed by interviewee 6 who points out the low interest of PAs and contractors in environmental/circular issues, "PA's interest in training about these issues is very low. In addition, there are several projects at the European level, however, there are few Italian participants. These initiatives are excellent channel for communication and learning but are not taken into consideration". Interviewee 8 also says, "only short-term economic benefits are considered at strategic level", but "circular economy practices have significant long-term environmental and economic benefits" (interviewee 6). All these observations can be summarised in the words of interviewee 9, i.e., "there is no interest either from the PAs or from the possible contractors in sustainable strategies. The demand is very little, however, in my opinion, the benefits derived are multiple: for example, recovery waste can save thousands of euros". The absence of a target market for CPP is also due to the communication strategy of contractors, as explained by interviewee 8, "it is difficult to find concrete with a percentage of recycled material in our area. If someone does it no one publicizes it, sometimes manufacturers do not to provide information and who set PP criteria are not able to determine whether a circular criterion can be met". All interviewees agreed that "PAs are responsible for meeting the needs of society because the citizen is the customer of PA" (e.g., interviewee 2) and, as explained by interviewee 4, "especially young people are more sensitive to environmental and social issues", probably, however "the "market share" of citizens demanding sustainable products is not large enough to justify a strategic/administrative change to promote CPPs" (interview 2). Interviewee 6 and interviewee 4 emphasise that young people are particularly attentive to green issues and "CPP is an excellent driver for attracting and training young resources that are

increasingly attentive to sustainable development issues, furthermore they can help increase the rate of innovation within these realities". Therefore, CPP can stimulate innovation through job creation. As the interviews reveal, circular economy is a strategic key. As said by interviewee 8, "Circular economy can be a strategic driver for PA to decouple economic development from resource consumption and enable the virtuous circle of end-of-waste". In this regard, again interview 8 states, "design or providing the reuse of procurement production waste in the construction sector represents an excellent opportunity to prevent these resources from being underutilized". Interviewee 4 says that "sustainable and circular strategies, such as the development of CPP, were adopted within PAs, citizens' demands would be handled more effectively, but also that PA's internal resource planning would benefit". Indeed, as interviewee 8 explains, "citizens will begin to pay attention to these requirements in public works procurement and intermediary figures will become more significant for the ecological transition".

The *regulatory system* is the sixth factor identified by the interviewees. As interviewee 1 explains, "the contracting authority define the criteria to be met according to current regulations, however, we find several standard for GPP but for CPP there are not many, so even if the contracting authority have the knowledge about the circular economy, they do not take responsibility for setting the criteria for circular product". To date, as interviewee 1 says, "codifying circular economy principles into appropriate regulatory language is not easy", and "currently it is already complicated to "translate" the contents of PP's standards" (interviewee 9). Interpreting regulations requires the right knowledge and to do several aspects need to be considered, as interviewee 6 says, "different skills are needed to analyse and interpret data and regulatory standards into information to define circular KPIs and control standards", indeed "not only administrative and legal skills are needed, but also technical and analytical skills" (interviewee 8). Another barrier of the regulatory system is the lack of systematic view, as interviewee 8 says, "we also try to support the reading of the necessary standards, but data cannot be found or there are standards that refer to other standards. We also provide legal regulatory services, but correctly interpreting circular and environmental regulations and standards is not easy because specific knowledge is required".

The latest barrier identified by the respondents is related with the *design of KPIs and control design* developed in PP. Interviewee 6 explains one of the possible methodologies for including a criterion "to define a criterion we proceed step-by-step because as first we assess the sector and its impacts, we take into consideration the MECs and after we develop a criterion that is included in the PP and if it is met by least two contractors so the criterion can be included in subsequent PP". However, as interviewee 8 says, "a multidisciplinary approach is needed to define KPIs from MECs, indeed MECs are many and complex". The numerosity of these requirements involves two problems:

1 too large number of criteria are required to award the contract

2 the development of CPP is hindered by the information content that KPI designers must manage.

Indeed, interviewee 6 states, "the requirements MECs are too many and it is difficult to meet them all, they are not easy to achieve, nor to prove, nor to verify such as MEC for furniture: various standards and certifications must be met (UNI standard on durability, eco-design, certifications on made in Italy, energy star for energy consumption, etc...)". As interviewee 8 says, "another mistake is made in the way the request is presented and

this happens because quantitative criteria are not defined". In this way it is difficult to design product or service which meet them and "their application is formal" (interviewee 8). Also, for design of KPIs and control design another barrier is the quantity and skills of resources indeed interviewee 6 says, "verifying sustainability in economic, environmental, and social terms is an activity that requires time and especially a highly technical qualification to verify the environmental characteristics". The design of control of public work execution is another problem that hinders the development of CPP, as interviewee 8 explains, "to date, top-down control is lacking, to develop CPP it is necessary to work out the right control procedures". Interviewee 6 says that it is also important to control the PA training process, "there are several training projects related to circular and green issues but there is not control". Although not directly related to Consip-managed procurement, interviewee 8 explains his experience with procurement procedures, noting that collaboration with universities allows for bridging the information gap, but also for developing appropriate indicators that support the transition to CPP, "university and municipalities are developing criteria with superior environmental performance, however, to design these criteria is not simple because there is a need for these criteria to be simple, clear and, above all, capable of guiding and justifying the adoption of certain practices and protecting green investments". Moreover, these criteria can be used for control, as interviewee 8 further explains, "the right control procedures need to be developed so that the application of the criteria is not just formal. The development of quantitative criteria can support and enable this control".

5 Discussion

The findings resulting from the empirical analysis primarily pertain to the contents of the purchasing procedures and the role of intermediaries.

Regarding the purchasing procedures, a content analysis was performed on 28 summary sheets of procurement procedures available on the web portal managed by Consip. Through the comprehensive reading of these procedures, eight clusters and six attributes were identified for Public Administration (PA) purchasing processes. Two clusters, totalling 15 procedures (53.57% of the summaries publicly available), were used for the analysis of absolute frequencies of the processed keywords. The content analysis conducted on the qualitative dataset developed with the Microsoft Excel program enabled the qualitative concepts to be transformed into directly measurable concepts.

The four identified sustainable areas (i.e., sustainable resource use, sustainable resource management, health and safety, and waste management) emphasise the interest of incorporating sustainable, environmental, and social objectives into procurement procedures. However, there is still a significant lack of connection between the social dimension of the TBL and GPP – only one out of four (health and safety) belongs to that area – and the percentages obtained from the content analysis for the KPIs of social issues confirm this observation. To develop a more holistic view of procurement processes, it will be necessary to develop and consider KPIs related to social issues (e.g., KPIs for occupational injuries, KPIs for job creation, KPIs for local supplies, etc.). Therefore, there is a need to incorporate more quantitative KPIs into procurement procedures for two reasons:

1 quantitative KPIs enable the development of improvement strategies for defining supplier selection criteria

2 the use of a numerical value enables supplier companies to more appropriately interpret the criteria and types of actions required for contract award.

The analysis of sustainable areas and aspects (attributes 2 and 3) confirms the lack of clarity of the criteria for suppliers' selection. Indeed, the criteria appear overly general or complex, and technical expertise and training are required to interpret them. This circumstance poses an additional barrier to the adoption of GPP. As a result, many companies with limited resources (such as SMEs) face challenges in accessing and participating in green procurement procedures. To overcome these obstacles, it is crucial to develop and define simple, clear, and adaptable requirements that consider the offerings of all types of organisations. By implementing more accessible and straightforward criteria, GPP can become more inclusive and enable a broader range of businesses to participate in sustainable procurement practices.

The absence of specific KPIs on supply chain transparency also confirms the lack of a holistic view of the supply chain. To increase the visibility of the supply chain, it would be appropriate to include the implementation of innovative solutions for this purpose among the purchasing criteria.

Only 2 of the 15 initiatives evaluated base their KPIs on the development and application of technology solutions aimed at data analysis. Incentivising the use of big data would make it possible to define interventions for rationalisation/efficiency in the organisational structure of services and products offered.

The last observation, no less important than the previous ones, is the link that emerges between the circular economy approach and GPP. As reported in the corporate materiality matrix analysis, Consip lists 'contribution to the circular economy' as one of its priorities. The sustainability reports, and to some extent the analysis conducted, confirm this; accordingly, several initiatives have been developed outside the context of PA procurement. However, as far as the PA purchasing procedures are concerned, the principles of the circular economy approach are reported in a 'casual' manner without defining a specific scope. The present research work allowed KPIs and their associated criteria to be classified as 'circular KPIs' based on literature deemed relevant to circular economy practices and principles (such as the Ellen MacArthur Foundation's frameworks). There is still a need to holistically integrate the link between circular economy and GPP. This model can be developed by considering other principles and practices that aim to create value throughout the product life cycle through closed-loop supply chain and life cycle thinking. KPIs with a high degree of circularity should be developed with the goal of closing cycles according to an input-output logic to indefinitely delay disposal. Cluster 1, for example, is characterised by a multiplicity of WEEE waste, therefore, of particular interest would be to develop KPIs of industrial symbiosis through upcycling and downcycling activities, or to consider the various design for environment (DfE) approaches as the design for reuse (DfR), design for longevity (DfL), design for modularity (DfM) and design for serviceability (DfS), design for disassembling (DfD) to ease upgrading and to ease serviceability and, later, disassembly.

Finally, at the conclusion of the content analysis conducted, no reference to the use of renewable energy, production of waste or the supply of defective products is considered

for GPP procedures. This aspect further confirms the low intensity of the link between circular economy and GPP.

These findings confirm the existing research about the lack of clarity (Michelsen and de Boer, 2009; Testa et al., 2012; Nissinen et al., 2009), as well as about the usage of generic criteria (Fuentes-Bargues et al., 2017) in GPP procedures, and call for future studies deepening the relationships between the sustainability dimensions and the GPP procedures, as well as the typologies of KPIs to be considered in these procedures.

Regarding the role of the intermediaries, the interviews conducted with key respondents have shed light on how these intermediaries can assist supplier companies in establishing relationships with major public purchasing centres. The significance of intermediaries playing this role lies in the fact that it aligns with their core functions, and their survival is largely dependent on providing such services to supplier companies. They also play a crucial role in helping suppliers overcome potential barriers that they might encounter when considering participation in GPP procedures. The insights gathered from these interviews emphasise the valuable technical and procedural support provided by intermediaries in facilitating and promoting sustainable procurement practices for supplier companies (Edler and Yeow, 2016). Above all the potential barriers identified, it also emerges a set of levers or enabling factors the intermediaries may exploit to facilitate supplier companies to advance towards a more CPP, and especially in the Italian context. This additional finding extends existing research investigating the dynamics of intermediation (Vanacore et al., 2023) and the roles of intermediaries (Rainville, 2021) about how to facilitate a more circular economy through PP and GPP procedures.

To allow the start of a collaboration between supplier companies and purchasing centres the intermediaries must align these players about the strategic objective of the collaboration. The strategic objective must conceive the circular economy approach, the financial instruments, and the innovation and job creation aspects. A second lever concerns the trend and business opportunities. Intermediaries may facilitate the collaboration by leveraging the discussion about the decreased availability of resources and increased costs of raw materials, energy, and disposal. A third enabling factor lies in the incentive/disincentive system. Intermediaries have the role to make aware supplier companies and purchasing centres that a GPP procedure, considering a more circular economy approach, will allow in the long period for greater rewards, for providing the financial resources, and for addressing regulations. The collaboration between supplier companies and purchasing centres under a GPP procedure is a matter of training and collaboration. Intermediaries can raise awareness between these players that collaborating each other under a GPP procedure allows to reduce information gap and to develop a systemic and systematic vision for CPP. Finally, intermediaries can encourage supplier companies and purchasing centres to develop quantitative indicators and to provide tools for evaluating the benefits achieved in the collaboration, which is a matter of more effective data design and analysis.

6 Conclusions

After the review of existing research on GPP and the following case study analysis of Consip, the paper determines gaps, shortfalls, potential corrective actions, and improvements of this legal framework under investigation and especially in the Italian

setting. The findings include also faults and misapplications in the operational phase, as it emerges as critical given several bounds emerged on this side. Moreover, they allow to advance a model that holistically integrates the GPP process with the circular economy principles of the 'closure of the loop' in terms of materials, resources, and energy.

The paper is aimed to support the development of an evolutionary model for GPP for a sustainability and circular economy transition at both European and, especially, Italian levels. A content analysis of 28 summary sheets of sustainable procurement process procedures reported on the web portal operated by Consip was conducted. Through the comprehensive reading of procedures, eight clusters were identified for purchasing process procedures. Two clusters, totalling 15 purchasing procedures (53.57% of the portal summaries), and six attributes, were used for the analysis of absolute frequencies of the processed keywords. The criteria and key performance indicators included in the analysis range from product related characteristics (e.g., eco-label, energy efficiency certifications, hazardous chemicals avoidance) to social and labour related ones (e.g., minimum wage, child/slave labour violations), but also trying to help local communities (e.g., zero km local sourcing, disadvantaged people job opportunity creation) and promote the circular economy approach (e.g., waste reduction, recycling, refurbishing, extended lifetime, and delayed obsolescence).

Our research contributes to advance knowledge in the studies about PP, GPP and CPP by showing the role played by intermediaries in supporting supplier companies to establish a relationship with major public purchasing centres, as in the case of Consip, and to overcome potential barriers they may encounter when deciding to approach a GPP procedure. The findings of this paper – substantiated by the interviews with the respondents acting as intermediaries in GPP purchasing procedures in the Italian setting – also have practical implications. First, they inform intermediaries about the enabling factors to be exploited to facilitate supplier companies (and purchasing centres) to advance towards a more CPP, and especially in the Italian context. Second, they provide to supplier companies and managers an additional reason moving towards innovative products, services, processes, and business models driving innovation and creativity, and the adoption of sustainability strategies and initiatives beyond the mere compliance. In addition, they offer to public entities, policy makers, and officers a novel understanding of their responsibility to be a driving force and a leading example especially in procuring goods and service, and they support a more qualified and proper application of GPP coherent with the circular economy principles.

As far as the limitations are concerned, the main ones regard the lack of insight into some sources of information. For example, the national action plan (NAP) and minimum environmental criteria (MEC) documents were not considered in the research conducted. Further future research could focus on the following aspects:

1 based on the prepared qualitative dataset, hypothesise the content analysis of the remaining clusters

2 integrate the analysis with the NAP and MEC documents related to the initiatives reported on the Consip corporate web portal.

In addition, given our research is addressed through a qualitative methodology characterised by an interpretative tradition, to generalise the results obtained, it will be necessary to address other case studies using the developed questionnaire and taking into consideration the identified barriers and the discussion about intermediaries' role. Future

case studies could consider other Consip intermediaries or other centralised purchasing centres for Italian public agencies and institutions.

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