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OPEN

Green public procurement in the most visited European museums: a comparison and a mapping

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While scholarly research on green public procurement (GPP) keeps growing, until now it has paid little attention to museums that must make decisions about GPP implementation. This paper breaks new ground by exploring GPP implementation in the most visited European museums. The proposed conceptual framework allows a comparison and a mapping of museums' GPP implementation levels while taking account of how these levels are related to the national GPP performance. Complementing this framework with the analysis of the up-to-date data from the Tender Electronic Daily database yields two central findings. First, museums that formalized their GPP policies in their strategic organizational documents exhibit higher levels of GPP implementation than other museums that have not done so. Second, the majority of the investigated museums follow national trends of GPP implementation, with examples of exceeding or falling below these trends being rare. The article is important for policy makers and practitioners as it highlights the importance of the factor of institutionalization of green procurement in individual organizations, which is crucial for successful implementation of green procurement.

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Introduction

Green public procurement (GPP) is commonly defined as “a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle compared to goods, services and works with the same primary function that would otherwise be procured” (Alhola et al. 2018, p. 97; see also Pacheco-Blanco & Bastante-Ceca, 2016). The shift from traditional public procurement to green public procurement holds significant implications for several reasons. Firstly, given that the public sector channels approximately 10% to 15% of GDP through public procurement (Plaček et al. 2023), a shift towards green procurement can serve as a substantial catalyst, fostering transformative effects on the economy. Furthermore, public procurement is responsible for nearly 40% of global emissions (Dimand et al. 2023), underscoring the profound environmental impact. A heightened emphasis on green procurement in this sector can, therefore, yield remarkably positive outcomes for the environment.

GPP implementation levels differ widely, both across countries (Yu et al. 2020) and types of public institutions, such as municipalities, universities, and political organizations (Plaček et al. 2021; Badell and Rosell 2021; Pacheco-Blanco & Bastante-Ceca 2016). Extant research on the determinants of GPP implementation has paid little attention to museums that are public institutions dedicated to the preservation of cultural heritage. Even though there exists a discussion of “sustainability” of cultural heritage organizations (Pop and Borza 2016), it has not yet included studies of how these organizations implement GPP. A similar gap is characteristic of studies exploring green museum marketing (Pino et al. 2021), green education of visitors (Jones 2016), the willingness of museum visitors to practice green behavior (Han et al. 2018; Han et al. 2018; Han and Hyum 2017), as well as the design of green museum buildings (Cole et al. 2020; Ge et al. 2015; Sterrett and Piantavigna 2018). The issue of buildings is potentially relevant for GPP, insofar as particular green criteria could be considered in tenders for green museum buildings, which could use energy-efficient equipment, such as lighting (De Graaf et al. 2014; Mueller 2013). Furthermore, Plaček et al. (2023) explore the attitudes of museum management in the Czech Republic towards GPP. Despite the positive attitudes of management towards green public procurement, the authors conclude that GPP is not fully institutionalized in the context of Czech museums, and identify the need for additional research to address this issue. Overall, both empirical or conceptual studies analyzing GPP in the area of the preservation of cultural heritage remain at a very preliminary level.

The present paper fills this gap in the literature. Focusing on the most visited European museums, the paper explores the possibility that museums can act as societal innovators that hold a considerable potential to promote GPP implementation. For this potential to materialize, museums must be committed to GPP and must translate this commitment into specific museum policies. This argument provides a much needed and unique addition to the museology literature that so far has lacked contact with the issues of GPP implementation (cf. Plaček et al. 2021).

Methodologically, the paper is grounded on the application of the algorithm proposed by Badell and Rosell (2021, cf. Rosell, 2021) to the up-to-date and currently unused data about the GPP characteristics of museums. The algorithm can identify green contracts among millions of regular public procurement contracts in the Tender Electronic Daily database (TED) by applying specific keywords translatable into all European languages. Doing so allows to gain new insights into the comparative aspects of the museums' organizational behavior while taking account of how GPP implementation in museums is affected by how this process occurs in the respective countries as a whole. In addition, the

paper conceptualizes the factors influencing the adoption of GPP in museum settings by simultaneously enriching known models with a museum-specific factor such as the incubation of social and economic innovations. This topic has so far been neglected in the current scientific literature.

Theoretical background

Much of the current GPP scholarship is premised on the idea that GPP is more than a set of regulations—it's a strategic cornerstone within the broader scope of environmental management. This relationship underscores GPP's pivotal role in an organization's holistic approach to environmental management. If environmental management is understood as a comprehensive strategy designed to minimize the environmental impact of an organization's activities, then GPP can be considered to be its key contributor, embodying a commitment to environmentally responsible procurement practices that extend beyond mere compliance. Effective environmental management, coupled with GPP, is widely seen to exemplify positive social change, often-times occurring in response to various stakeholder pressures. Stakeholders, ranging from government bodies and NGOs to the general public, wield considerable influence in shaping organizational behavior. Their collective pressure acts as a powerful force propelling organizations toward the adoption of environmentally sustainable practices, including the incorporation of GPP. This understanding of stakeholder pressures aligns with the well-established model of corporate social responsibility (Aguilera et al. 2007; Athanasopoulou and Selsky 2015).

Various theoretical perspectives have been advanced to elucidate how stakeholder pressures result in the divergent adoption patterns of green public procurement (GPP) across organizations. Widely employed theories encompass institutional theory, agency theory, stewardship theory, upper echelon theory, resource dependence theory, and opportunity theory (Ye et al. 2022; Plaček et al. 2023; Johnson and Klassen 2022; Rejeb et al. 2023; Shadrina et al. 2022; Polonsky et al. 2022; Qazi and Appolloni 2022). Whereas institutional theory is concerned with the mechanisms of coercive, isomorphic, normative, and mimetic stakeholder pressures (Jacob Nsiah-Sarfo et al. 2023; Aguilera et al. 2007) multi-level theory of social change in organizations differentiates these pressures according to diverse levels—ranging from the organizational sphere to national and transnational dimensions. Nevertheless, as noted by Ye et al. (2022), most of these theories in isolation fall short of providing a comprehensive understanding of the variations in GPP implementation.

Simultaneously, the impact of stakeholder pressures on organizational behavior is contingent upon their effectiveness. It is recognized that these pressures often manifest as moralistic communication, and that seamlessly translating them into the institutional fabric of modern society is not always straightforward (Jauernig and Valentinov 2019). Instances abound where organizations, confronted with such pressures, opt for opportunistic, superficial, and hypocritical responses (ibid). Consequently, the realization of social change depends on the deeper nuances of organizational culture, which can be defined as the shared values, beliefs, and assumptions that guide the behavior and practices of the members of an organization (Schein 2010).

Changing organizational culture is not an easy task, as it requires a clear vision, a consistent strategy, and a strong leadership. However, there are some mechanisms that can facilitate the process of culture change, depending on the context and the goals of the change project. As elaborated by Painter-Morland (2008), a key mechanism of this change is revisiting and defining the core organizational values, i.e., the fundamental principles

that guide its actions and decisions. They reflect the identity and the purpose of the organization, and they influence the culture and the behavior of its members. Using of Painter-Morland's (2008) terminology, in the context of organizational culture, the transformation required to embrace GPP practices can be aptly described as moving beyond the check-the-box mentality. Painter-Morland (ibid) emphasizes the need for organizations to cultivate novel and authentic values that extend beyond a mere checkbox mentality. This shift implies a profound alteration in the underlying ethos of the organization, fostering a genuine commitment to sustainability rather than a token acknowledgment. This commitment implies an internalized understanding of ethical considerations and sustainability principles, shaping the organization's behavior in a manner that transcends explicit regulations and is deeply ingrained in the organizational identity.

There are two major strands of relevant empirical scholarship investigating the factual adoption of GPP. One strand predominantly focuses on macro- and meso-level determinants, examining factors such as country characteristics—such as per capita GDP and government revenues as a percentage of GDP (Rosell 2021). Notably, richer countries with larger public sectors tend to exhibit higher levels of GPP implementation. The macro-level determinant of public sector size is particularly influential in shaping GPP practices across nations (ibid). Additionally, the presence of Government Procurement Agreements (GPA) is positively correlated with the implementation of GPP and the average procurement price (ibid). Furthermore, at the meso-level, regional and local authorities emerge as frontrunners in GPP implementation compared to central government bodies within the European Union (ibid). Etse et al. (2022) shed light on the role of national regulations in shaping sustainable procurement practices, noting that the influence of organizational leadership mediates these effects. Sönnichsen and Clement (2020) contribute insights into various organizational aspects, categorizing them into three subcategories: Size, Strategy, and Top-level Management; Policies and Quality of Contracts. These organizational aspects, in conjunction with individual behaviors, practices, and operational tools, collectively influence the procurement process. Individual behaviors encompass agency and cross-departmental management, as well as beliefs, awareness, and individual guidance. Operational tools, on the other hand, include process and prioritization tools, carbon emissions and criteria settings and evaluation tools, standards, standardization, and legal regulations, along with supplier selection. Sönnichsen and Clement (2020) acknowledge the potential variations in the relative importance of each factor in GPP implementation.

Another major strand of empirical inquiry delves into the intricate dynamics between internal institutionalization and external stakeholder pressure, particularly in the context of GPP implementation within US municipal settings (Dimand and Neshkova 2023). The authors introduce the concept of “green predisposition” as the initial level of institutionalization, tied to management discretion in determining the need for a new purchase or a repurposing of existing projects – a decision akin to the conventional make-or-buy dilemma (Dimand and Neshkova 2023). Following this, the familiarization phase involves assessing the potential impact of GPP and the extent of change required by the organization (Dimand and Neshkova 2023, p. 6). Subsequently, the adoption of GPP policies signifies a formal acceptance, entailing mutual understanding and sharing among organizational members. The final phase extends to the integration of GPP into the strategic management system and formal organizational structures, with GPP indicators becoming integral to performance management systems (Dimand and Neshkova 2023). Overall, empirical findings by Dimand, Neshkova (2023)

affirm a positive correlation between higher internal institutionalization and an increased likelihood of engaging in green GPP practices. Moreover, a higher likelihood of adopting green practices is associated with external stakeholder pressure. The analysis of their interaction unveils intriguing outcomes, indicating that external pressure plays a particularly pivotal role in the initial phase of GPP institutionalization (Dimand and Neshkova 2023).

Thus, the current landscape of GPP implementation scholarship emphasizes the pivotal role of the organizational culture change process within the broader context of the stakeholder environment. At the same time, this role still remains under researched for the case of the European museums that employ the formalization of GPP policies as a catalyst for the necessary organizational culture change. Toward this end, the following section sets out a conceptual framework discussing how the stated mission of museums resonates within society and the potential transformative effects that the formalization of GPP policies may have on shaping the organizational culture of these organizations.

Conceptual framework

One of the basic functions of modern museums is to serve as social innovation incubators and ecological centers (cf. Plaček et al. 2021). Museums fulfilling this function will not only educate people about ecological issues and cutting-edge green technologies but also engage in organizational behaviors that promote sustainability and other green goals on an everyday basis. More specifically, this means that museums interested in GPP adoption must establish respective organizational routines for everyday use, and thus formalize their GPP commitment. This argument draws support from the EU Circular Economy Action Plan, which underscores the importance of integrating GPP into daily organizational routines of the concerned public authorities (European Union, 2020). According to Ann Behravesch et al. (2022), such routines must be supported by organizational capacity, resources, organizational culture, and internal stakeholders.

The organizational formalization of GPP can be seen as a multistage process. The first stage is the most general and could be limited to mentioning GPP commitment in the museum mission statement. The second stage could expect including GPP into the museum's strategic plan, e.g., in the form of a particular indicator or action aimed at reaching carbon neutrality goals. At the third stage, a museum can be expected to produce its own sustainability or carbon neutrality plan. At the last stage, a museum elaborates internal policy documents that focus strictly on GPP practices (see Fig. 1).

The museums that have formalized GPP policies will show higher GPP implementation levels. An important effect of the completed formalization is the hardwiring of specific GPP processes, such as awarding and executing, into everyday organizational routines, while the incomplete formalization, which would not go further than a mention of GPP in the mission statement, would be less effective because of possible organizational ambiguities and unclear prioritization of GPP.

This brings us to our first research assumption: Museums with formalized GPP policies will show higher levels of GPP implementation.

Furthermore, if museums have strong social commitment embedded in organizational culture, they can be expected to exercise it through GPP. If the most visited museums in a country can be expected to exhibit the strongest social commitment, they will likely act as leaders in green purchasing in their respective national museum sectors. One reason they could perform better on GPP in comparison with the average national museum GPP uptake is that their elevated position will help them secure sufficient resources and capacity, such as educated staff. We can also

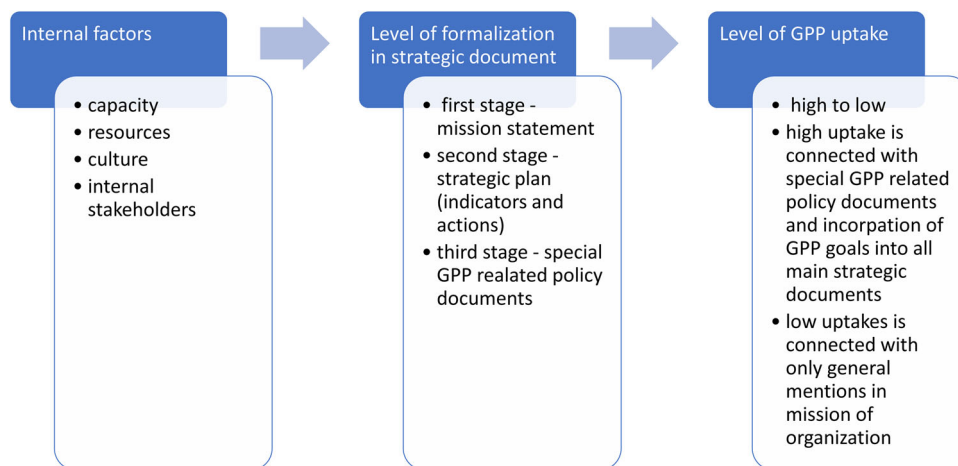


Fig. 1 Conceptualization of the importance of strategic documents for GPP uptake. Internal factors: internal factors include the capacity and resources of the organisation, the organisational culture and the interest of internal stakeholders. These internal factors create the preconditions for formalising GPP in strategic documents. Formalization in strategic documents: formalization in strategic documents is divided into three levels, ranging from general statements to specific commitments and guidelines. Level of uptake: based on the level of GPP formalization, an association is made between the proportion of GPPs that are commissioned. Source: authors.

expect the museum sector to exhibit higher average uptake of GPP than the respective national average, because the social commitment of museums could lead them to fulfill the functions of ecological centers and social innovators, especially if the structure of museum procurement includes sustainable buildings, equipment, and preservation materials. This could be schematized by the following Fig. 2.

Thus, our second research assumption is that the GPP implementation level of the most visited EU museums will exceed that of their respective national museum sector, while the GPP implementation level of the national museum sector will exceed the respective national average.

The juxtaposition of the two assumptions generates a matrix that can help to map the types of GPP commitment as well as GPP implementation levels for specific museums. This matrix is likewise usable for other types of public-sector organizations (see Table 1).

The y-axis shows the museum's level of GPP uptake, as a proxy for the museum's GPP commitment, including motivation and engagement of managerial staff. The low level of GPP uptake broadly means that the internal documentation of the museum does not refer, or only occasionally refers, to GPP, and no specific GPP policies are in place. The high level of GPP uptake indicates the existence of specific GPP policies and a direct reference to GPP in the organizational mission, vision, or strategic plans. The x-axis denotes the average level of GPP uptake in a particular country where the museum is located. Low uptake means that GPP is not a common practice, whereas high uptake corresponds to this practice being near the standard.

As shown in the matrix, the juxtaposition of the two axes allows us to differentiate between four types of GPP implementation in museums. *Innovator* – this type is typical for museums whose level of GPP uptake is high despite the low national GPP performance. Such museums exhibit strong internal engagement for GPP and outpace the national average because they see GPP as an important sustainability tool. Such museums can deal with possible regulatory hindrances and transaction costs and could be an inspiration for other museums and institutions in their country.

Trend followers 2 – this type is descriptive of museums whose low level of GPP uptake reflects the respective low national average. Such museums prefer to follow a national trend. They do

not see GPP implementation as a key strategic issue. They focus on strategic goals other than sustainability and do not experience any pressure from external stakeholders to adjust their strategic priorities.

Trend followers 1 – this type refers to museums whose level of GPP uptake is high and in line with the respective high national average. Such museums could outpace the national average, but the high level of GPP implementation remains a standard for the public sector. Museum managers feel obliged to implement GPP because of their formal duties and stakeholder expectations.

Resistant – this type is characteristic of museums that keep their level of GPP uptake low despite the national high performance on GPP. Such museums do not follow the national trend and show a lack of internal commitment to GPP, possibly due to lacking resources, knowledge, or managerial motivation. Other possible reasons could be path-dependence of museum policies, which retain their traditional focus on heritage preservation and education and remain unresponsive to the current concerns of sustainability.

Data and methods

The research design rests on the combination of four methods: desk research, correlation analysis, regression analysis, and data analysis.

Desk research was used to identify the most visited European museums in the period of 2019–2020 according to the data from Statista (<https://www.statista.com/statistics/747942/attendance-at-leading-museums-in-europe/>). We decided to use the period of 2019–2020 to ensure that the data were not influenced by the Covid pandemic. Table 2 shows the most visited museums and their attendance in the indicated period.

From the analysis have been excluded the Vatican Museum, the State Hermitage, and the State Tretyakov Gallery since they are located outside the EU, and the data about their procurement processes were accordingly not available. Museums from the United Kingdom are available until 1 January 2021.

Desk research occurred during March – May 2022. In the first step, we surveyed web sites of all listed museums, and studied the documentation such as mission statements, annual reports, strategic plans, other plans, museums policies, and press reports, to check whether museums' goals, plans, and policies

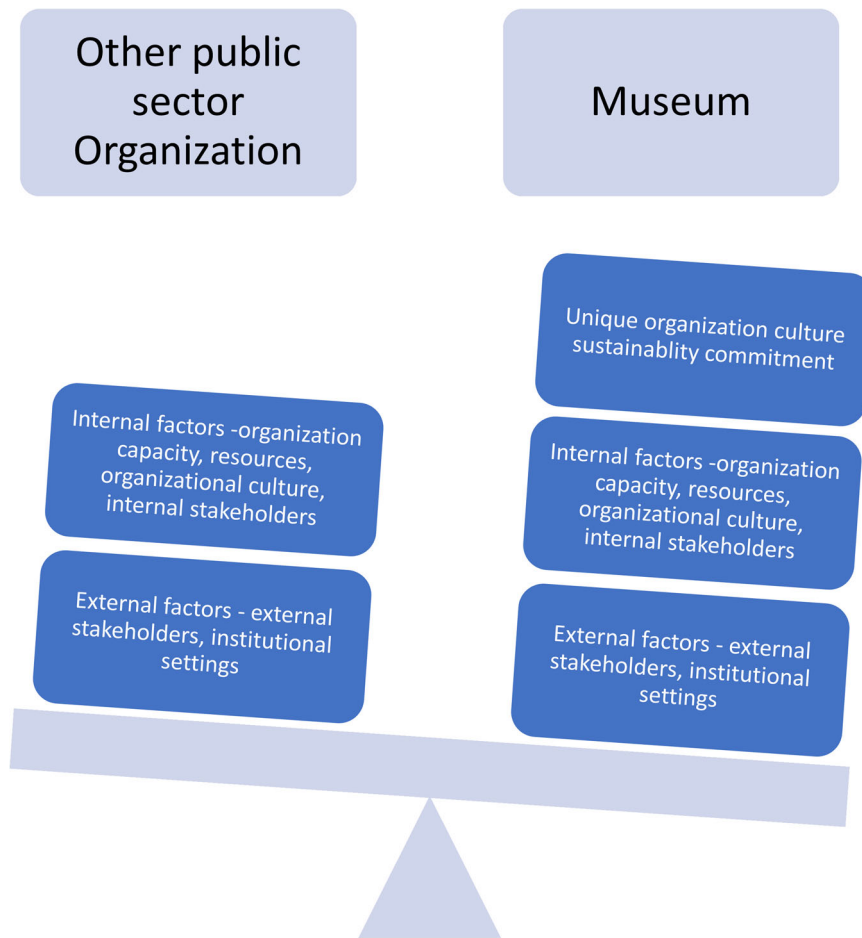


Fig. 2 Differences between museums and other public sector organizations in terms of GPP uptake. The figure compares the key factors for GPP implementation between a generic organization and a museum. The main difference between a generic organization and a museum lies in culture, of which commitment to sustainability is an important component. Source: authors.

Table 1 GPP implementation matrix.

Average uptake of GPP in a museum	Average country level of GPP implementation	
	Low	High
High	Innovator	Trend follower 1
Low	Trend follower 2	Resistant

Source: Authors.

incorporated GPP practices. If the surveyed museums did not publish the necessary information on the web, we asked for it directly via email. The information thus collected was subsequently categorized. We conducted this research in full awareness of several limitations. There exist different country-specific traditions of publishing information on their web as well as different terminologies related to both strategic planning and GPP. Some museums had no clearly defined hierarchy of strategic documents, with specific plans and policies being parts of a single strategic document or vision. The term GPP is likewise sometimes not used on its own merit but is rather deemed part of the broader concepts of sustainability or carbon neutrality.

For the analysis there have been introduced three artificial variables that assess the number as well as the importance of

Table 2 The most visited European museums during the period 2019-2020 (in 1000s).

Name of museum	2019	2020
Louver	9600	2700
Tate Modern	6098	1433
Vatican Museum	6883	1300
British Museum	6208	1275
Reina Sofia	4426	1248
Natural History Museum	5424	1197
National Gallery	6011	1197
State Hermitage	4957	969
Center Pompidou	3270	913
State Tretyakov Gallery	2836	894
Victoria and Albert Museum	3921	872
Musée D’Orsay	3652	867
Science Museum	3254	862
Museo Nacional Del Prado	3203	852
Cité des Sciences et de l’Industrie	2370	793
Rijksmuseum	2700	675
Galleria Degli Uffizi	2362	659
Van Gogh Museum	2100	517
Auschwitz Birkenau Museum	2300	502
National Museum of Scotland	2210	444

Source: Statista (<https://www.statista.com/statistics/747942/attendance-at-leading-museums-in-europe/>).

Table 3 Results of correlation analysis.

	Missions and vision	Strategic plan	Sustainability policy	Carbon neutrality plan	Green purchasing policy	Average proportion of GPP
Missions and vision	1					
Strategic plan	0.34188	1				
Sustainability policy	0.53674**	0.43644**	1			
Carbon neutrality plan	0.46088**	0.25678	0.31052	1		
Green purchasing policy	0.62678***	0.21429	0.49099**	0.83452***	1	
Average proportion of GPP	0.68903***	0.32584	0.46695	0.69566***	0.69566***	1

*Significant at 10% level; ** at 5% level; *** at 1% level. Source: Authors.

Table 4 Results of regression analysis.

Variable/specification	Missions and vision	Strategic plan	Sustainability policy	Carbon neutrality plan	Green purchasing policy
The type of strategic document	0.223	0.139	0.14	0.256	0.256
constant	0.023	-2.8·10 ⁻¹⁷	0.042	0.052	0.052
F coeff	0.013	0.301	0.126	0.012	0.012
R ²	0.689	0.467	0.696	0.696	0.696

Source: Authors.
Bold variables are significant on level 0.05.

documents referring to GPP. The first variable is a simple count and reflects how many of the museum’s documents refer to GPP. To determine these dummy variables, five types of documents were evaluated for each museum, with the variable taking the value of one if the document referred to some form of GPP policy and zero otherwise. These variables were evaluated separately to see the influence of each type of document on GPP value, and together to see whether reference to some form of GPP policy in these documents influenced the GPP value, or whether a higher number of documents referring to GPP policies increased the GPP uptake level.

The other two variables (Implar, Implgeo) are based on the assumption of the varying relative importance of the documents, with the importance ascending in the following order: Green purchasing policy; Carbon neutrality plan; Sustainability policy; Strategic plan; and Mission and vision.

Both variables assign the value of 1 to the last document in the sequence, but differ in the way they rank the next document. To each document, Implar assigns the value of one plus the value of the previous document, such that the relative importance of the documents is expressed as an arithmetic sequence with a difference of 1. The second variable, Implgeo, takes the relative importance of the documents as a geometric sequence, such that each document has importance of twice that of the previous one. For both variables, for each museum, we summed the values of all documents that refer to a GPP policy and divided the outcome by the maximum possible rating (Implar 15, Implgeo 31). This gave authors a value indicating what importance was actually achieved.

Classical Pearson correlation coefficients (Eq. (1)) were then applied to all variables. The statistical significance of the coefficients was tested with a t-test (Eq. (2)).

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x}) \cdot (y_i - \bar{y})}{S_x \cdot S_y} \tag{1}$$

$$T = r_{xy} \sqrt{\frac{n-2}{1-r^2}} \tag{2}$$

To calculate the coefficients, we used the least -squares method of regression analysis.

Before running the regression, authors performed pre-tests to minimize collinearity as well as to check the normality of the data and homoskedasticity. The models were chosen in such a way as to justify the assumption of linearity (Eq. (3)).

$$y_i = \beta_0 + \beta_1 \cdot x_{i1} + \beta_2 \cdot x_{i2} + \dots + \beta_k \cdot x_{ik} + \varepsilon_i, \tag{3}$$

For the purposes of data analysis, we used the Tender Electronic Daily (TED database that contains all active calls for tenders for supplies, works and services, as published in the Supplement to the Official Journal (OJS) in the European Union. The database contains contracts from both EU countries and those in the European Economic Area. Most importantly for this research, this database contains millions of contract awards and contract notices from all EU member states.

Focusing on the years between 2009 and 2022, algorithm looked for environment- and GPP-related words in all contract notices and contract awarding notices. In doing so, authors used their own search engine that we have developed relying on the approach of Rosell (2021). The search engine is a data mining instrument that allows us to conduct a word search in the awarding criteria in the contract award notices in all countries in their national languages as well as in the second primary language (e.g., English or German). The search has been concentrated not only on the terms such as ‘environment’ and ‘sustainable’, but also on carbon footprint, life cycle assessment (LCA), and emission standards, among others; even though this search admittedly could not capture all aspects of GPP, especially those related to technical conditions and contract performing clauses. Using the search engine, authors identified public procurers from each EU member state working with GPP and got access to the information about the general level of GPP uptake in the most visited museums and the average level of GPP uptake in the museum’s sector in countries where are these museums are located. To test our second assumption, authors also considered the average national level of GPP adoption, which takes account of the public buyers in a given country.

Table 5 Average GPP uptake in the most visited museums.

France	Average GPP	Average GPP in museum sector	Country average
Louvre	0,342066958	0,171553945	0,1431885
Musée D'Orsay	0,163043478	0,171553945	0,1431885
Centre Pompidou	0,25	0,171553945	0,1431885
Cité des Sciences et de L'Industrie	NA	0,171553945	0,1431885
Britain	Average GPP	Average GPP in museum sector	Country average
British Museum	0	0,036139456	0,043821
Natural History Museum	0,5	0,036139456	0,043821
Victoria and Albert Museum	0,055555557	0,036139456	0,043821
Science Museum	0,081632651	0,036139456	0,043821
National Museum of Scotland	0	0,036139456	0,043821
Tate Modern	NA	0,036139456	0,043821
National Galery	NA	0,036139456	0,043821
Spain	Average GPP	Average GPP in museum sector	Country average
Reina Sofia	0	0,035714286	0,040638
Museum Nacional Del Prado	0	0,035714286	0,040638
Netherlands	Average GPP	Average GPP in museum sector	Country average
Rijksmuseum	0	0,023809524	0,056216
Van Gogh Amsterdam	NA	0,023809524	0,056216
Poland	Average GPP	Average GPP in museum sector	Country average
Auschwitz-Birkenau Museum	0	0,055555556	0,007168
Italy	Average GPP	Average GPP in museum sector	Country average
Vatican Museum	NA	0	0,0171418
Galleria Degli Uffizi	NA	0	0,0171418

Source: Authors.

Results

Before discussing the results of the verification of our assumptions, we present the results of the correlation analysis. The results are presented in the following Table 3.

Author's ran a regression model for each specification of GPP policies in particular documents. The dependent variable was the average uptake of GPP at the museum level. The independent variable shows by what value the dependent variable increases if the museum incorporates the GPP policy in the documents. The results of regression analysis are shown in the following Table 4.

The regression and correlation analyses yield interesting results that confirm the importance of GPP commitment in the mission and vision of the considered museums. In contrast, a reference to GPP in the strategic plan and sustainability plans is not statistically significant, while a reference to GPP in specific documents such as the carbon neutrality plan and GPP policy is statistically

significant. It can be also observable that the incorporation of GPP in the mission and vision, in the carbon neutrality and GPP plans increases the average GPP uptake for museums by 0.222559 to 0.255833. These findings confirm our first assumption.

In Table 5, we present the results of the verification of the second assumption.

While we initially tried proving the statistical difference between individual museums, the national museum sectors, and the national GPP uptake, the data unfortunately did not allow us to perform the standard t-test and chi square test.

Table 4 reveals the high heterogeneity of GPP uptake within countries. In France, we see that the most visited museums such as Louver and Center Pompidou outpaced their national museum sector and the national average, with the exception of Musée the Orsay, where the difference is not significant. The museum sector as a whole also performs better than the national average.

Table 6 GPP implementation matrix.

Y axis: The average uptake of GPP in museums from low to high	Innovators: Natural History Museum	Trend follower 1: Louver, Musée D'Orsay, Center Pompidou, Resistant
	Trend follower 2: Victoria and Albert Museum, Science Museum, British Museum, National Museum of Scotland, Reina Sofia, Museum Nacional del Prado, Rijksmuseum, Auschwitz –Birkenau museum	
	X axis: Average country level of GPP implementation from low to high	

Source: Authors.

In Great Britain, we see that the Natural History Museum, Victoria and Albert Museum, and Science museum have higher average uptake of GPP than the national museum sector and the national average. The exception is the Museum of Scotland and the British museum, which showed zero GPP uptake. There is no significant difference between the average uptake in the museum sector and the national average.

In Spain, the national average GPP uptake exceeds both the average of the museum sector and the average of the most visited museums, which was zero.

In the Netherlands, Poland, and Italy, we cannot fully judge the situation because of the missing data, but it is clear that the museum sector of the Netherlands and Italy is outperformed by the national average. This relationship is different in Poland, where the museum sector showed a higher level of GPP uptake.

Moreover, the investigated museums, for which the data is available, can be categorized within the GPP implementation matrix outlined in Table 1. Table 6 illustrates this categorization. We see from Table 6 that the majority of the investigated museums are trend-followers of the two above described types. Only one museum significantly outperformed the national trend, and no museum turned out to be GPP-resistant, likely because the level of GPP implementation in all considered countries except France was very low.

Discussion

In contrast to the findings of Dimand and Neshkova (2023), our study contributes a more nuanced understanding of the critical role played by internal institutionalization in the adoption of GPP within public sector organizations. Importantly, our research affirms that the internal institutionalization of GPP practices does indeed exert a positive influence on the adoption of GPP. Beyond this, our investigation underscores the significance of various mechanisms linked to diverse stakeholder groups, shedding light on their pivotal role. Additionally, we validate the relevance of mechanisms articulated within institutional theory, such as coercive pressure, coercive isomorphic, and normative and mimetic pressure (Jacob Nsiah-Sarfo et al. 2023). This multifaceted perspective enhances our understanding of the intricate dynamics surrounding GPP implementation in public sector entities.

Key findings of this study is that the incorporation of GPP policies into the mission and vision of museums, as well as into their carbon neutrality and GPP plans is positively associated with their levels of GPP implementation. This is in line with Ann Behraves et al.'s (2022) argument underlining the importance of the internal factors. The mobilization of internal factors (organizational culture, capacity, internal stakeholders) and external factors may enable the incorporation of GPP plans into key museum policies and documents. Even though this finding does not directly reveal how museums actually meet their sustainability goals (cf. Rosell and Badell 2021), it underscores the relationship between GPP implementation and the incorporation of GPP into key organizational documents.

This finding is important because it disconfirms the popular view that museums may act as social innovators. At least regarding GPP, museums turn out to be doing not more than just follow national trends. Thus, it can be expected that the GPP implementation in museums likely faces bottlenecks similar to those in other organizations, e.g., the lack of capacity (Dimand 2022), preference for the lowest price (Plaček et al. 2021), leadership style (Al-Nuaimi et al. 2021), and others (Polonsky et al. 2022). Generally, we take these bottlenecks to be indicative of the slow institutionalization of GPP in the museum sector. Because the institutionalization process takes time, it will react to emerging trends with a certain delay, which may be specifically caused by path dependency (Plaček et al. 2018), internal politics, lack of innovation culture, lack of administrative capacity, or lack of stakeholder pressure.

Conclusions and policy recommendations

Our exploratory study is the first of its kind to offer insights into green procurement practices in the museum sector. According to our findings, GPP implementation is positively associated with the incorporation of GPP policies into the mission and vision as the most important general document, while incorporation into specific documents such as the carbon neutrality plan and special GPP policy documents is also statistically significant. In contrast, the implementation within the strategic plan and sustainability plans does not appear statistically significant.

The article shows evidence that museums follow national trends in the green public procurement rather than act as innovators in this area. We can observe the same trend at the sector level. The explanation may be quite simple: due to the complexity of their activities, museums may perceive purchasing as a service process rather than a strategically important process; therefore, they focus attention on key areas where sustainability effects are more visible. This way, our results embed the understanding of GPP adoption particularly in the context of institutional theory, stakeholder theory and CSR.

Our study opened a new avenue for further research. It is undoubtedly important to identify the key mechanisms and factors at work in the green procurement process. Case studies focusing on drivers and barriers to GPP adoption in museums can be an important contribution in this phase of research. It is important to look beyond the large and well-visited museums and to consider local or regional museums of different profiles, while putting these results into a specific national context. Methodologically, it would be interesting to use deep structured interviews with key players in GPP implementation so that we understand the problem in greater depth. It is also necessary to focus on national-level studies and identify the key macro-, meso- and micro determinants that operate in the cultural heritage sector.

From a public policy perspective, we recommend incorporating GPP policies into key documents of the organization. It is also necessary to discuss the effects of reporting on the achievement of GPP objectives. Self-reporting by museums may be accepted in the first phase, but independent monitoring

mechanisms should be in place at more advanced stages of implementation. Finally, in implementing GPP policies, it is necessary to provide cultural heritage institutions with the necessary support, which consists of building GPP awareness among management and staff, offering training programs, mentoring, and developing methodologies.

The proposed study is subject to several limitations that warrant consideration. Firstly, it is crucial to acknowledge Ann Behraves et al.'s (2022) argument emphasizing that green procurement constitutes just one facet of the broader sustainability concept. This raises the possibility of trade-offs or complementarities between environmentally responsible procurement and other sustainability practices related to inclusion, social equity, and other dimensions. For instance, a museum might prioritize socially responsible procurement over environmentally responsible procurement, each of which is a part of a broader sustainability management. The present study does not examine the possible relationships between different dimensions of sustainability management.

Second, the study remains necessarily exploratory because our sample is focused only on the largest museums. Our findings therefore require verification by subsequent research. Third, the search engine that has been used cannot analyze the full range of the qualifying criteria. This may have led to underestimating the actual level of GPP for some museums. Fourth, the formalization of GPP policy in museum documents has been analyzed manually. As each country uses different reporting standards and not all documents are reported in English, some documents may have been missed or misinterpreted. In order to take account of these limitations, documents have been searched manually to make sure that the information is evaluated in context, instead of using keyword text searches. It is also important to consider social desirability bias, indicating that strategic documents and annual reports may contain socially desirable information rather than the unvarnished truth.

Finally, the authors acknowledge the unique characteristics of public procurement in the cultural heritage sector, where certain contracts may center on the conservation and repair of historic buildings, posing challenges in the application of green criteria.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Author contributions

M.P. was responsible for literature review, conceptualization of research questions, research design and interpretation of results, J.R. processed data on the level of green procurement in individual countries, sectors and institutions, V.V. participated in the preparation of the theoretical part, interpretation of results, discussion and conclusion. M.K. statistically processed the data and prepared their interpretation. All authors contributed with comments to the final version of the paper.

Competing interests

The authors declare no competing interests. One of the authors is a member of editorial board of *Humanities and Social Science Communication*.

Ethics approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

This article does not contain any studies with human participants performed by any of the authors.

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