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An Approach to Environmental Criteria in Public Procurement for the Renovation of Buildings in Spain

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Abstract: In order to contribute to climate neutrality within the EU in 2050, it is necessary for administrations to play a driving role through green public procurement for building renovation (GPPBR). Among the main barriers that slow down the GPPBR, a lack of knowledge of the parties involved can be highlighted. Faced with this scenario, the aim of this article is to provide a compilation, as a preliminary state of the art, of the most important environmental measures to bring to the GPPBR specifications. The methodology used for this compilation and critical analysis consisted of a systematic search for laws, regulations and guides prepared by Spanish public administrations, as well as looking into other international information sources, mainly collected from the EU. Despite the fact that related technical information is abundant, it is scattered and at times impractical. This study can be useful as a basis for both drafting specifications and highlighting the need to develop other specific and advanced technical procedures to assist GPPBR professionals.

Keywords: environmental; green public procurement; renovation; construction; energy; circular economy; innovation; green; sustainable

1. Introduction

There is a clear opportunity to promote building renovation through Green Public Procurement (GPP). The implementation of environmental measures in buildings for energy efficiency and transition to a circular model depends on the active involvement of all the agents around. Although the Public Administration, by function and regulatory work should first take these measures and play a leading role in the private sector.

1.1. Green Public Procurement for Building Renovation (GPPBR) in the EU

The main policies in the European Union are framed in the current climate and environmental emergency [1]. It is essential to achieve climate neutrality for the EU by 2050, and meet environmental goals committed by governments through the Climate Agreement: likewise, constructing play a relevant role, among other sectors such as transport.

On the one hand, it is imperative to reduce energy consumption caused by buildings themselves [2], since this sector represents around 40% of total consumption in the world [3,4]. Furthermore, 75% of all the buildings in the EU are energy inefficient, whereas their annual renovation rate is only 0.4–1.2% [4,5]. According to the European Green Deal [5], in order to achieve the EU goals, the intervention rate on buildings should at least double. Directive 2012/27/EU [6] requires that new buildings have nearly zero energy consumption and sets an annual renovation of 3% of the total area of buildings when it comes to central administrations, so that they meet current energy efficiency requirements. According to

Directive 2010/31/EU [7], every Member State should set a long-term strategy to support the renovation of the building stock.

On the other hand, it is urgent to implement decisively the principles of a circular economy in buildings [3]. Awareness and knowledge on the characteristics of circular public procurement, based on the implementation of circular policies and strategies, are essential [8]. According to the New Action Plan for the circular economy in the EU [3], the building sector demands huge amounts of resources, uses around 50% of all extracted materials and generates more than 35% of the total waste. Directive 2008/98/EC [9] provides that Member States shall take action to prevent waste generation, by promoting reuse, repair and recycling of construction and demolition materials and products, among others.

Within this context, public procurement is a key action for implementing the EU environmental policies, since it makes up around 19% of the gross domestic product [10]. Thus, an effective green public procurement is needed, as a force for change. Directive 2014/24/EU [11] already introduces environmental considerations regarding award criteria, technical specifications and construction conditions. The EU also offers Member States an optional tool, the GPP criteria, as a reference for developing environmental clauses [12]. Despite the fact that these criteria offer great potential to carry out environmental policies, based on studies from an international background, it is found that the level of implementation of the GPP is varied, and it is generally limited [8,13–15]. The lack of knowledge and definition when it comes to introducing environmental criteria in tender papers, and the absence of practical information for designing, are some potential causes. Moreover, further development of the GPP criteria in relation to innovative solutions is required [15,16].

1.2. Green Public Procurement in Building Renovation (GPPBR) in Spain

In Spain, the regulation of the GPPBR starts from the environmental policies of the EU [17], as well as energy renovation needs of the existing building stock.

Around 21% of existing buildings in Spain are older than 50 years, and 55% were built before 1980, when there was no obligation to be thermally insulated [18]. Residential buildings are the highest consumers of final energy consumption caused by construction. However, buildings in tertiary sector, which occupy only 13% of total square meters of building space, consume 42% of final energy [19]. That is why these buildings and particularly those for Public Administration (such as health care, education, assistance, administrative centers...) show a very significant potential to reduce carbon footprint and other environmental impacts. In this respect, and given its exemplary role, Public Administrations establish specific obligations for building renovation in energy matters and concerning a transition to a circular economy model. The renovation of buildings themselves is part of this model, since one of the principles is to keep products and materials in use [20]. According to the National Action Plan for Energy Efficiency [21], the Central Administration should annually renew 3% of the total area of buildings—a goal nearly achieved in Spain during the period 2014–2019 [19].

It is estimated that public procurement in Spain represents between 10 and 20% of GDP, depending on the year [22]. As it is a key economic sector, public procurement in terms of building should include environmental criteria, which are collected in various regulatory tools. Among the provisions of the General State Administration affecting the GPPBR, it is worth mentioning the following:

- The Law on Public Sector Contracts (LPSC) [23], which refers to the possible consideration of environmental measures in technical prescriptions and award criteria. It states that the evaluation of the best value for money can include environmental factors. It also refers to life cycle cost (LCC) as a means of assessing the best cost-effectiveness. It also considers environmental labels as a means for testing.
- The Draft Law on climate change and energy transition [24], which promotes and allows an efficient use of energy from renewable sources in the area of energy efficiency and building renovation.
- The Ecological Public Procurement Plan (2018–2025) [17]. It refers to the GPP criteria set by the European Commission, highlighting the carbon footprint reduction.

- The Draft for National Integrated Energy and Climate Plan 2021–2030 [25], with measures aimed at reducing primary energy consumption and promoting renewable energies. It provides for energy renovation over 3% of the built-up area in public buildings of the General State Administration, and at least 3% of the buildings of regional and local administrations.
- The Draft for the Long-term Decarbonization Strategy 2050 [26], which estimates that, for that time frame, 80% of the built stock will be made up of buildings already built. For this reason, the actions on the existing building are prioritized. On the other hand, most of new buildings (representing the remaining 20%) will have nearly zero energy consumption.
- The Circular Economy Strategy [27], which considers building sector and building renovation with own relevance in the materials cycle, climate change, resilience and local economy, among others. It also has a high level of improvement concerning treatment of construction and demolition waste (CDW) and optimization of resources used.
- The Long-term Strategy recently updated for energy renovation in the building sector in Spain. It includes the need to provide policies and actions in all public buildings [19].
- The Royal Decree, which modifies the Basic Document on Energy Saving from the Technical Building Code (TBC) [28], which includes basic requirements related to: restriction of energy consumption, conditions for the control of energy demand, conditions of thermal and lighting installations, minimum contribution of renewable energy to cover the demand for sanitary hot water and minimize electrical power. Currently, it requires revision to introduce the requirement of charging points for electric vehicles.
- The PAREER program [29], to encourage energy renovation of buildings so as to improve the energy rating.

This state framework is as a reference for the different regional Public Administrations.

Regarding public procurement in Spain, the percentage of contracts in which the best quality-price ratio is valued as an award criterion is high if related to the EU average [30]. However, the implementation of environmental policies in the public procurement of buildings in Spain is low if compared to other countries. The group of countries known as "Green 7" (Austria, Denmark, Finland, Germany, the United Kingdom, the Netherlands and Sweden) [31] shows a higher number of tenders in terms of ecological criteria, rather than the rest of the EU countries. It also reaches the highest qualifications in questionnaires about environmental measures. One of these measures is the introduction of environmental management systems as well as the use of innovative tools for public procurement, such as the one related to life cycle [13,31]. Likewise, the Nordic countries, through their 2010 Action Plan, are pioneers in promoting sustainable production and eco-innovation [14].

However, in all EU countries, there is still a long way to go. An example is the lesser importance of environmental measures in the GPP, approximately 10% in the European context [14], if compared to other criteria. These can be costs, construction process report and delivery time. In some cases, the weighing of environmental criteria is even negligible. Especially in lower budget tenders, it can be seen that the financial approach tends to a higher valuation with regard to other criteria, such as the environment-related ones [31]. Likewise, the lack of adoption of the LCC criterion is generally observed [32].

There are several reasons why innovative or environmentally responsible public procurement are not yet fully implemented. The main barriers found are the lack of resources, knowledge, staff training, motivation and funding [8,31,33,34]. This has been confirmed in various studies about the implementation of GPP policies [30,31], and reflected in the Report on public procurement in Spain - 2017, prepared by the Ministry of Finance and Public Function [35]. Thus, the mentioned barriers have increased in small towns with fewer resources to set up specialized contracting departments. Without them, it is not possible to gain knowledge and obtain developed strategies for GPP [31]. As a consequence, the implementation of circular economy principles is often the result of random chance or unsystematic experimental models [8].

For this reason, it is necessary to develop suitable technical procedures for the award of contracts [35]. The dissemination of these procedures and the training of professionals who have to

put them into practice, together with coordination and cross-cutting strategies of organizations are required, since the model design-tender-build in sustainable buildings requires minimal training and management to be adopted [36].

1.3. Objective of the Article

On this basis, the aim of this article is to open up new avenues so as to improve implementation of environmental criteria in the GPPBR in Spain. Among the main barriers, the lack of knowledge of the agents involved can be mentioned.

As a first step to facilitate knowledge, a compilation is made in Section 3, as a preliminary state of the art about environmental measures included in the regulations and guides of all Spanish regions, in line with the European context for implementation of GPP. In Section 4, an analysis is carried out concerning the feasibility of applying such measures, alongside the identification of potential barriers. Section 5 contains the review of measures along with conclusions, limitations and possible future research. Given the abundant but scattered information, there is a need to develop advanced technical procedures for professionals responsible for public procurement, including evaluating indicators.

All of this seeks to move towards an objective: the GPPBR should be truly "ecological". Thus, the Administration should have an exemplary role. Knowledge generated should help increase the motivation among professionals and evaluate proposals, not just according to initial costs but the best value for money. This would allow to gain the benefits of sustainable renovation throughout the life cycle and promote climate neutrality of the EU in 2050.

2. Methodology

As explained above, the purpose of this article is to contribute to the improvement of knowledge so as to carry out the GPPBR in Spain. That is why methodology used is based on an approach on the state of the art of the major environmental measures proposed by the Spanish Public Administrations, regarding the goals set by the EU about building renovation. Due to the particular features of each region and the territorial organization in Spain, these measures were set out by the State and regional administrations through various papers: laws, regulations and guides. Each of them within the scope of its competencies. The present article is an in-depth study of the regional GPPRB.

The methodology used is summarized in Figure 1 and described below.

In order to obtain documentation about the GPPBR at regional level, internet sites of all Spanish regions and Autonomous Cities were checked first. All of them can be accessed through the "General Access Point" web site, created by the General State Administration:

https://administracion.gob.es/pag_Home/atencionCiudadana/SedesElectronicas-y-Webs-Publicas/websPublicas/WP_CCAA.html#.Xzu2Pugza00

Next, by entering each site, a search on subjects about sustainability in construction and GPP was carried out: building, renovation, climate change, energy efficiency, circular economy, waste management, public procurement of innovative solutions (PPI), environment, territory, sustainability, and urban planning. This search led to different web sites of regional governments: departments, councils and organizations for energy, business competitiveness, building, housing, land, etc. General and specific tools were found about the implementation of measures in the GPP and building renovation. Appendix A contains a broad list of laws (L), regulations (R) and guides (G) found (a total amount of 145 papers). Figures 2 and 3 provide a summary of the main topics and the percentage that each type of tool represents over the total analyzed. Figures 4 and 5 show the main topics related to the documents found.

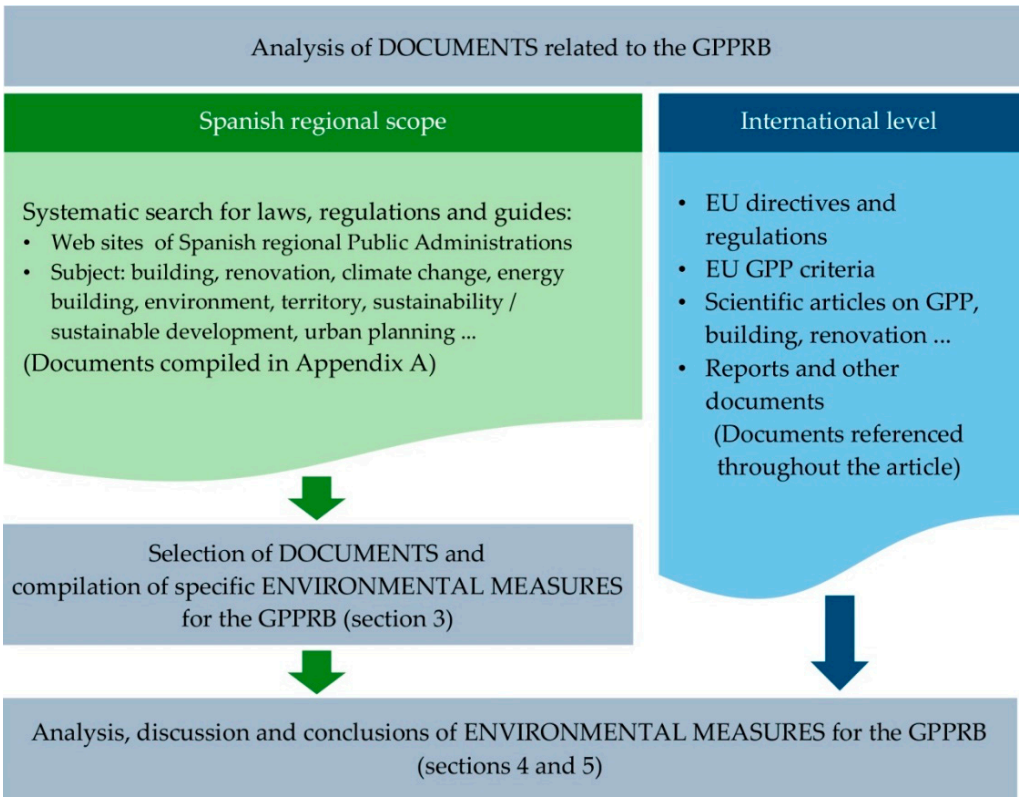

Figure 1. Methodology.

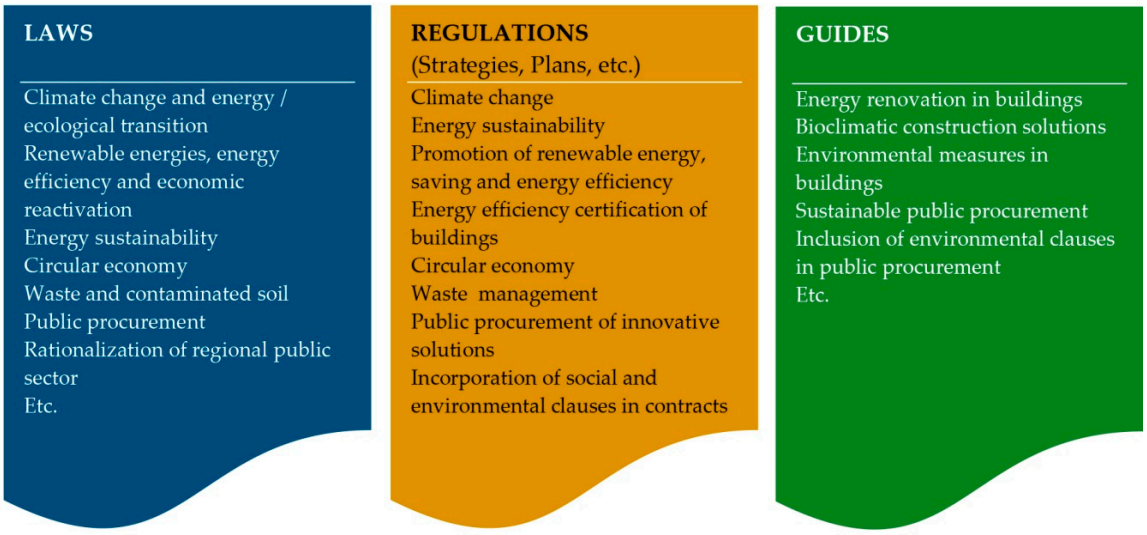

Figure 2. Documents considered for the compilation of environmental measures in the green public procurement for building renovation (GPPBR) of the Spanish regions and Autonomous Cities.

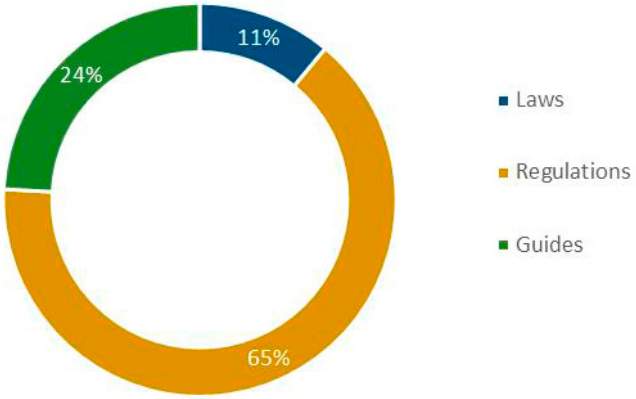

Figure 3. Percentage of papers collected according to the type of document.

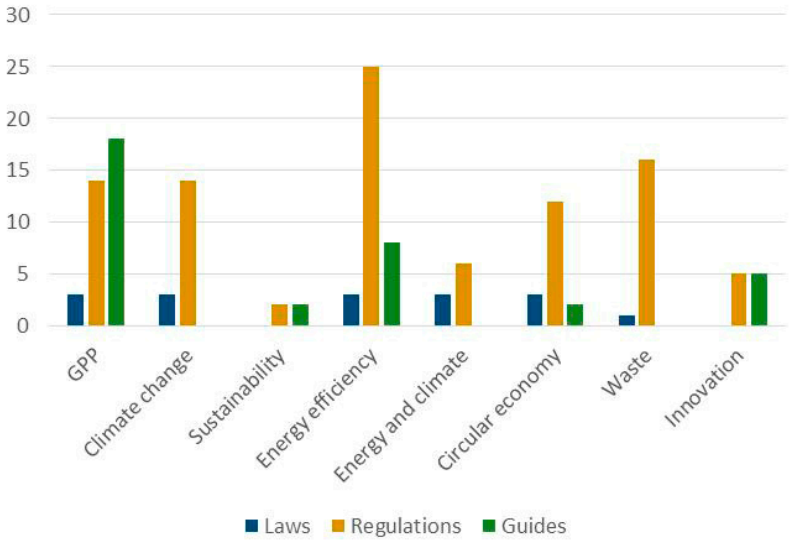

Figure 4. Number of laws, regulations and guides compiled according to topics.

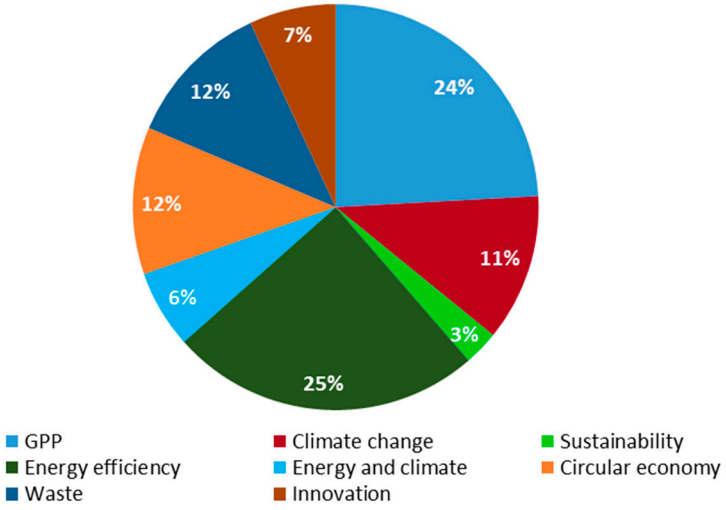

Figure 5. Percentage of documents collected according to topics.

Once papers were collected, they were analyzed to draw environmental measures specifically applicable to the GPPBR.

The environmental measures are set out in Section 3 together with a list of documentation as close as possible to the different subjects, or documentation developing advanced and useful aspects to bring into contracting procedures. Although various laws, regulations and guides were compiled from all regions and autonomous cities, the list of these papers as well as measures included in this article is not exhaustive. Yet, it is enough to obtain consistent results as a reference, and open up avenues for further research. Moreover, it is necessary to mention that a comparative study among regional Administrations is not the purpose of this approach.

At the same time, other international sources on implementing environmental measures in buildings and GPP were analyzed. Particularly, legal framework and criteria for the EU GPP, as well as other articles and papers outlined in this article, were taken as a basis. The study of all documentation allowed a rough idea of the situation and issues of the GPPBR, as explained in Section 1. All of this made it possible to enrich the analysis, discussion and conclusions of the measures collected within a broader context, as Sections 4 and 5 show.

3. Results. How is GPP Implemented in Spain?

3.1. Regional Administration Papers

Based on the state regulatory framework set out in the Introduction, regional Administrations have drawn up a large number of laws, regulations and guides related to the subject of this article. The following are papers concerning climate change, energy transition and circular economy, closely related to the GPPRB.

- Climate change laws: whereas Spanish climate change law is still to be approved [24], three regions have previously approved own laws Illes Balears in 2019 [37], Andalucía in 2018 [38] and Catalunya in 2017 [39]. Likewise, Islas Canarias, the Comunidad de Madrid and the Comunitat Valenciana are still drafting respective laws on climate change and energy/ecological transition.
- Laws, strategies and plans for energy saving and efficiency in public buildings: in general, all regions, as well as the autonomous cities of Ceuta and Melilla, have implemented actions to improve the energy efficiency in public buildings. The National Plan describes the latter [21], although it is worth highlighting regional plans with comprehensive objectives for public buildings and public facilities, as well as specific measures to include in procurement documents; it is worth mentioning the Energy Sustainability Law of the País Vasco, which binds public administrations to improve energy efficiency and use renewables in buildings [40], and additionally, the plan of Catalunya during the period 2018–2022 [41], the plan of the Comunidad de Madrid, approved in 2017 [42], the plan of the Comunitat Valenciana in 2016 [43], and the plan of Navarra [44]. On the other hand, strategies indicate lines of action with an impact on public contractual measures. The most recent ones include the Euskadi 2030 Energy Strategy [45] and that of Extremadura, for public regional administration buildings [46].
- Circular economy and waste regulations: as in energy matters, these documents also mention constructing sector and even public procurement; for its current interest, it is worth mentioning the Extremadura 2030 Green and Circular Economy Strategy [47], as well as strategies for the circular economy of Galicia, País Vasco, Aragón, and Navarra [48–51], all of them with targets set for 2030. Furthermore, the Circular Economy Law of Castilla-La Mancha [52], the first region to legislate circular economy [53], deserves special attention. Additionally, Andalucía and Islas Canarias are currently drawing up own laws. In addition, regional waste regulations also contain actions to manage the waste stream from public buildings; that is the case of the Comunidad de Madrid Waste Strategy [54], which has also developed the MADRID7R Circular Economy platform [55] and the Cantabria Waste Plan [56].

Although the GPP model specifications are very helpful for contracting authorities, there are few that have been prepared. These include the following:

- Model specifications for specific administrative clauses recommended by the Consultative Board for Administrative Contracting of the Comunidad de Madrid [57], with references to the inclusion of mandatory environmental clauses.
- The model for contracting energy services in public administration buildings of the IDAE [58] and the guide for drafting specifications on energy performance contracts with guaranteed savings of the ICAEN [59], which allowed the first contracts to be put out to tender [19].

In recent years, since the approval of Directive 2014/24/EU, of which the LPSC [23] is transposed, many guides related to GPP have been elaborated, even if these papers address the subject broadly, and also include building-related aspects. Among them, it is worth mentioning the following:

- The 2020 "General Guide on Aspects Related to Environmental Protection", developed by the Comunidad de Madrid [60]. In this paper, information is provided on obligations in force in this regard. The latter are included in the specifications for public contracts.
- The guide "Frequently Asked Questions and Quick Answers for Responsible Public Procurement", 2017, from the Comunidad de Madrid [61]. It is a general paper with a practical purpose, which helps the contracting body prepare specifications. Along with interesting strategies to achieve the objectives pursued, it also offers environmental considerations illustrated with success stories.
- The "Guide for Including Social and Environmental Clauses in Contracting", by the Junta de Andalucía, 2016 [62]. This paper contains mandatory clauses and others recommended as an example for any type of contract.
- The 2018 "Practical Guide for Including Social and Environmental Responsibility Clauses in Administrative Contracting", from the Principado de Asturias [63]. It is a general guide that considers water saving, materials, energy and recycled materials as potential environmental clauses.
- The Environmental Clause Sheets of Navarra, 2017 [64], with generic technical content but standing out a clear exposure of contractual procedure phases and how to verify measures.
- Likewise, various regions have committed to continue developing guides. The Government of Cantabria is to draft a guide including environmental criteria for contract valuation: a measure already established in the Strategy for Action against Climate Change in Cantabria 2018–2030 [65]. The government of the Illes Balears is to develop a technical guide to meet requirements set forth in the Law on climate change and energy transition in public works: reduction in greenhouse gas emissions (GHG), energy efficiency, water saving and waste reduction [37].

It should be noted that some regions collaborate with international projects to develop technical measures and evaluation criteria within the GPP. A remarkable example is the Basic Guidelines for applicating environmental criteria in the purchase of products/services by public administration of the GreenS project [66]. The Regional Energy Agency of Cádiz and the Andalucía Federation of Municipalities and Provinces have taken part in it.

Some guidelines were found, containing environmental criteria for buildings. Due to the relevance for adding environmental measures to the GPPRB, the following should be mentioned:

- The "Green Guide", published by the Generalitat Valenciana and the IVE in 2020 [67]. This paper addresses globally environmental measures to be included in public procurement specifications concerning the field of constructing of the Generalitat Valenciana. It also extends the scope of energy efficiency to saving water and circular economy. It is a paper designed for continuous updating, and greatly facilitates the addition of measures in accordance with the LPSC [23].
- The "Public Services" guide from the series "Guides for Energy Efficiency", published by the Government of Cantabria in 2013 [68]. It compiles a series of recommendations for decision-making in building renovation, quantifies energy saving, investments and the adequacy of measurements for financing, through a Company for Energy Services (CES).
- The "Environmental Criteria for Buildings", published by the Public Society for Environmental Management of the Government of the País Vasco (Ihobe) in 2020 [69]. It covers aspects to

enhance public procurement in building, considering environmental impact during the life cycle, with good practice examples. Although the content focuses on office buildings, recommendations are applicable to buildings with different uses.

- The 2015 "Guide for Sustainable Construction and Renovation for Housing in the País Vasco" [70]. It is aimed at professionals in the constructing sector, and offers relevant information to assess environmental impacts. Although it is specific to residential buildings, many actions can be taken for the renovation of tertiary sector buildings.
- The newsletter for "Saving and Energy Efficiency in Public Buildings", published by ICAEN in 2009 [71], informs and trains energy managers. This paper shows technology, facilities, habits and examples to adopt saving and efficiency measures in buildings. Measures to boost energy efficiency, renewable energy systems and water saving can be drawn from this publication.

It should also be noted that the guidelines set out in this section are not mandatory, so the application of environmental criteria proposed for the GPPRB is left to contracting bodies.

However, mandatory application of laws and regulations is bringing about results. Specific actions result from compliance with regional energy efficiency plans for buildings and public facilities. For example, in Catalunya, nearly all the energy acquired by the regional Administration is certified as 100% renewable [72]. In the Comunidad de Madrid, heating renovation and air conditioning installations in public buildings represented 64% of actions of the regional plan during the first year [73]. In the Comunitat Valenciana, it was possible to reduce energy consumption in public buildings by 11 million kilowatt hours in one year [74].

Results after putting into practice regional circular economy strategies are also observed. For example, in Extremadura, advice at the local level to identify municipal green initiatives is being given, as those related to carbon sinks [75]. In Galicia, the first public building built entirely using certified native wood has been put out to tender, within the framework of the Lugo Biodinamic project [76]. In the País Vasco, the evolution of CDW recycling in recent years is upward (42% in 2013, 59% in 2015 and 61% in 2016), but there is still room for improvement until reaching 70% set as a target for 2020 [77].

Finally, it is interesting to mention that several regional administrations carry out annual monitoring of the GPP results. For example, in the País Vasco, 24% of ecological tenders were carried out in 2019, which represented 22% of the total economic amount. In the building sector, the GPP represented 27%, with an economic volume of 28% with respect to the total tendered in that sector [78].

3.2. Environmental Measures

In this section, the most relevant measures set by Spanish regional Administrations are compiled and grouped according to the following subjects: passive energy saving measures, proactive measures for energy efficiency and water saving, life cycle, products and waste management. Those measures required by administrations as an example to be incorporated into the GPPRB, are presented next. Figure 6 shows the number of measures in each subject.

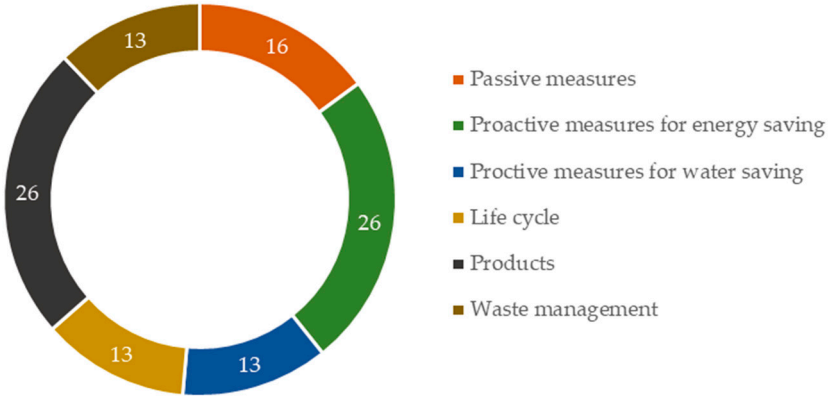

Figure 6. Environmental measures (total: 107).

3.2.1. Passive Measures for Energy Saving and Environment Protection

Passive strategies should be adopted from the beginning of the architectural design phase:

- If volume of buildings can be modified, shape should be designed to maximize the capture of solar energy; in some cases, a high level of compactness is valued [67,69].
- Optimize orientation of different building areas, according to temperature, evaluating performance of sun exposure studies [70].
- Openings design (number, size and distribution), according to orientation to increase heat gains during winter and reduce them in summer [67].

So as to reduce energy demand, it is essential to act on the thermal envelope:

- Reduction in the demand for energy consumption by lowering wall thermal transmittance, floors, roofs, openings and removing thermal bridges [68,69].
- Promote ventilated roofs and facades with greater ability to cool the building envelope in summer or provide thermal stability in winter, depending on the degree of ventilation [67,68,79].
- Evaluate landscaped roofs and facades to minimize energy flows and obtain other benefits; these solutions can remove pollutants through vegetation, mitigate heat island effect and benefit the ecosystem and the urban landscape, etc. This measure is conditioned to the resistant capacity of the renovated building structure [67,79,80].

To obtain heat gains, solar capture solutions can be added: glazed galleries, Trombe walls, thermal inertia walls, etc. [67–69,79,80].

With regard to sun protection, the following recommendations are provided:

- Supply solar protections to prevent indoor overheating, designed according to orientation.
- Use vegetation and its location to improve atmosphere quality: generation of shade, damping of noise, etc. [67,68,79–81].

It is advisable to provide natural ventilation through building design. For this purpose, choosing the best location on the plot should be a factor to consider; the most suitable shape, size and orientation of the building and its openings; the provision, if necessary, of screens (natural or artificial); interior layout; the shape of the cover, etc. Concerning solar protection, the following types of ventilation can be adopted:

- Cross ventilation, by wind action through openings in the façade or other open spaces located on different sides.
- Use thermal draft, either by chimney effect or static aspiration (Venturi effect).
- Induced ventilation, with devices allowing cold air to pass through, such as wind towers [67,79,80].

To provide the building with cooling, natural air cooling is recommended: by introducing treated air to lower temperature or increase humidity content. Depending on site conditions, different types of air treatment are proposed:

- Evaporative cooling by using water or vegetation that absorbs heat and increases humidity content.
- Heat sinks to precool air, such as buried ducts, patios or night cooling [67,69,79,80]. Measures on buried or semiburied construction are also proposed [80].

The incorporation of natural habitats in the vicinity of buildings or in the interior, such as gardens, groves or patios with vegetation, contribute to all kinds of benefits; the design and selection of plants and materials should be consistent with the intended purpose and friendly to the environment [67,69].

Bringing in space for bicycle storage and personal mobility vehicles (such as scooters and others) helps promote use and reduce carbon emissions, with better air quality [37,67].

Some examples obtained from the analysis performed are shown in Figure 7.

Passive measures for energy saving and environment protection	
Architectural design	• Building shape and compactness • Orientation, shape and compactness of building • Building openings design • Optimization of orientation of building areas
Thermal envelope	• Reduction of transmittance and elimination of thermal bridges: walls, floors, roofs, holes • Roofs and ventilated / landscaped facades
Solar heating	• Glazed galleries • Trombe walls /thermal inertia walls
Solar protection	• Fixed / movable shaft protections • Vegetation
Natural ventilation	• Cross / with thermal draught / induced
Natural air cooling	• Evaporative cooling • Temperature reduction: buried ducts, patios, night cooling • Buried / semi-buried construction
Habitats in patios and gardens	• Landscaped areas / patios with vegetation • Efficient and non-invasive plants
Parking spaces	• Parking for sustainable means of transport: bicycles, personal mobility vehicles

Figure 7. Examples of passive measures for energy saving proposed by Spanish regional administrations.

3.2.2. Proactive Measures for Energy Saving

It is advisable to limit energy consumption in public buildings, with specific goals:

- To reduce energy consumption in public buildings by 7.7% in 2022 compared to the 2017 consumption, as proposed by the Generalitat de Catalunya [41] or by 18% in 2025 compared to the 2014 consumption, as proposed by the Comunidad de Madrid [42]. These reductions are equivalent to the annual energy renewal of 3% of public building area, established by Directive 2012/27/EU. In the Comunitat Valenciana, the target set is to reduce energy consumption by 25% in 2025 compared to 2014 consumption [43]. In the "Green Guide" [67], it is proposed that existing buildings meet regulatory conditions established for new construction or, in case of impossibility, to reduce by at least 40%, both the consumption of nonrenewable primary energy and the total.
- To improve the energy rating of public buildings before 2025: at least 25% of buildings, as proposed by the Comunidad de Madrid [42] and 25% of buildings with energy consumption over 200,000 kWh/per year proposed in the Comunitat Valenciana [43].
- To integrate renewable energy systems—both for thermal use and electricity generation—into 25% of buildings before 2025 [42].

- To contract energy audits: to obtain knowledge of energy consumption profile during a building's use phase and quantify the possibilities of cost-effective saving energy [37,41,67,68,81–83].
- To contract energy service companies (ESCs) or an energy manager to monitor consumption and energy efficiency improvements [37,79,81,82,84];

Promoting self-consumption can be achieved by incorporating renewable energies:

- To generate electric power, for own use or network supply, such as photovoltaic/solar thermal energy, mini-wind energy or micro cogeneration or thermal installations, by using renewable-source systems, in situ or in the vicinity of the building: low temperature solar thermal energy, biomass, geothermal, hydrothermal, micro cogeneration or aerothermal (subject to the consideration of renewable energy in electrically driven heat pumpsand) [67].
- The acquisition of photovoltaic systems and solar thermal energy installations should be implemented considering the LCC [66].

So as to set objectives including renewable energies, as the following cases:

- In Catalunya, a forecast has been established to implement until 2022 solar energy installations on building roofs, which generate renewable energy for 2% of energy consumption in buildings and facilities of the Generalitat de Catalunya [41].
- The Junta de Castilla y León establishes the objective of reducing fossil fuel use in administrative buildings, considering biomass as a reference fuel [85].
- In the Illes Balears, the administration is to discard nonrenewable energies, providing for the progressive replacement of installations using fossil fuels by others using renewable energies [37].

Various administrations are acquiring electric power 100% from a renewable origin:

- The electrical power contracted to supply buildings and departments of the Generalitat de Catalunya should be from 100% a renewable origin, and may be reduced to a minimum of 70% established by the Climate Change Law [39], depending on whether certain conditions are present.
- Electricity supply contracts tendered in the Illes Balears should certified energy from 100% recent renewable origins, according to Law 10/2019 [37]; as far as possible, they should be self-supplied using renewable electricity with self-consumption or bilateral contracts. The latter contract with renewable energy producers from the Illes Balears should be promoted.
- The "Green Guide" by the Generalitat Valenciana proposes the addition of electricity generation systems from renewable sources and/or signing a contract with electricity suppliers coming from guaranteed renewable sources, accredited by the National Market Commission and Competency (NMCC) [67].

In order to upgrade the energy efficiency of interior lighting installation, the following recommendations should be adopted: replacing luminaires with LED lighting systems, using control systems, regulating the level of lighting according to natural light, as well as sectorize circuits [67,68,70,81,84].

In terms of energy efficiency, it is also advisable to incorporate energy-efficient sanitary taps [67].

To promote a greater use of electric vehicles, some Administrations are planning a major endowment of charging points than established in the Electrotechnical Regulation for Low Voltage (ERLV) [86]. An example is the Generalitat Valenciana, through the Green Guide [67], and the Generalitat de Catalunya, which contemplates the installation of 200 charging points in Administration buildings [41,87].

It is also advisable to contract energy through a central public procurement service of Administration [30]. The Junta de Castilla y León created the OPTE Platform to facilitate the energy purchase of different Board bodies and energy contracts optimized annually [84].

Other measures related to energy saving are: performing reactive energy correction, applying inmotics with IT tools for monitoring consumption, proposing regular studies of tariff optimization or an analysis and adaptation of contracted power, as well as training users in good energy practice.

Figure 8 shows some examples of proactive energy efficiency policies obtained from the analysis.

Proctive measures for energy saving	
Limitation of energy consumption	• Reduction of a certain percentage of energy consumption in a given percentage of Administration buildings • Improvement of energy rating • Annual energy renovation, around 3 percent of the area occupied by Administration buildings • Nearly zero energy consumption buildings
Energy audits	• In all public buildings or with energy consumption> x kWh / per year
ESCs	• Energy Service Companies or energy manager
Renewable energy	• Promotion of self-consumption: by using renewable energies (photovoltaic, thermosolar, mini-wind, microgeneration, solar thermal, biomass, geothermal, hydrothermal, aerothermal ...) for generating electricity or thermal installations (DHW production and air conditioning), in situ or in the building vicinity • Installation of photovoltaic panels in certain percentage of Administration buildings • Regulation to enable installation of solar / photovoltaic panels on existing building roofs • Procurement of photovoltaic and solar thermal systems considering LCC • Electricity with a guarantee of 100 percent renewable origin
Interior lighting	• LED lighting • Presence control systems and regulation systems • Circuit sectorization
Energy-saving efficient sanitation fitting	• Maximum temperature limiters • Thermostatic adjustment / cold opening • Heat exchangers • Efficient recirculation elements
Charging points for electric vehicles	• Provision of charging points higher than established in the ERLV • Minimum provision in Administration buildings
Energy contracting	• Central recruitment service • Contract optimization
Other measures	• High-efficiency elevators and escalators • Reduction in engine consumption • Reactive energy correction • Inmotics: IT tools for consumption monitoring • Users training in good energy practice

Figure 8. Examples of proactive measures for energy saving proposed by Spanish regional public administrations.

3.2.3. Proactive Measures for Water Saving

Some of the measures proposed are the following:

- Installation of: consumption reduction devices and systems for reuse gray water and/or rainwater [67,69,88], specifying maximum flow rate in taps and maximum flush volume in toilets and urinals, as well as saving devices [67,88,89]; treatment of waste water, efficient irrigation systems even with recycled water [67]; components for saving water such as flow restrictors, the overflow of rainwater collection system with discharge to surrounding surface waters or underground; sustainable urban drainage systems (SUDS) to collect rainwater [70].

- Tap and cistern maintenance to avoid leaks or water loss, and where appropriate, replacement by others that are environmentally advanced [69].
- Systems for network water leak detection [69], specifically in buried pipes [70].
- To conduct a water audit after the first year of building use, in order to continuously monitor performance [69,70].
- Water pressure regulation in collective supply systems to reduce consumption [70,88].
- To landscape green areas of buildings with efficient plants for water saving [67,70].

Some examples of these measures obtained from the analysis are summarized in Figure 9.

Proactive measures water saving	
Water use systems	• Gray water reuse • Rainwater harvesting • Water purification according to supply needs: to flush sanitary fittings, private garden irrigation
Efficient sanitary fittings, toilets and flush urinals	• Faucets with flow limiters, diffusers in sinks and showers, timed taps, mixer taps • Half-load tanks • Toilets and urinals with sensors / urinals without flush
Leak detection	• Detection systems, specifically in buried ducts • Taps and tanks maintenance
Consumption accounting	• Sectorized meters • Audit after one year from the start of using the building
Water pressure regulation	• Pressure regulation in collective systems to reduce consumption
Gardens and vegetation	• Efficient irrigation systems • Native plants with low water requirements

Figure 9. Examples of proactive measures for water saving by Spanish regional public administrations.

3.2.4. Life Cycle

The advisable measures regarding a building's life cycle, which are, therefore, more ambitious, are the following:

- To use LCC for cost calculation, and analyze profitability of sustainable products from a global cost-effectiveness viewpoint. This is already established by regulation in Andalucía [38] and suggested in guides and other provisions [69,90,91].
- To include award criteria and special execution conditions considering the environmental impact generated by products or service during the entire life cycle, as established by regulation in Andalucía [38].
- To have available planning tools against climate change, with binding determinations for different Public Administrations. It is the case of the Andalucía Climate Action Plan (ACAP), being prepared at the time of writing this article [92], or the Strategy for mitigation and adaptation to climate change in the Región de Murcia [93].
- To contemplate measurements of circular economy strategies or plans. For example, the Galicia Circular Economy Strategy [94] sets the following issues for public works: a study of taxes for dumping and waste disposal; training, design and construction with reused materials; the design and use of buildings through passive strategies, clean energy and local materials to reduce consumption of natural resources (energy and water). In addition, it is worth highlighting the building design to increase resilience against extreme meteorological phenomena, such as the frequent floods in the eastern regions [95].

- To design buildings so that future changes of use and distribution can be performed simply [69]: For example, the layout of structural walls, interior partitions with quick and removable mechanical joints, distribution of installations (preferably through technical ceilings and/or floors), etc. [70].
- To design buildings in a flexible way, with spaces allowing new future facilities; in this way, slashes and generation of waste are avoided, and access to facilities for removal is facilitated [70].
- To dimension buildings based on an estimate of uses and needs in the medium and long term, for future reuse [69].
- To study space and equipment needs and decide whether they can be met by internal redistribution of space or a partial/total renovation of existing buildings [69].
- To make resistance demands and durability in structure calculation compatible with sustainability demands, such as optimizing the amount of material [70].
- To calculate the carbon footprint for products, supplies and services available. For example, in the Illes Balears, this requirement has become mandatory for large and medium-sized companies [37]. Additionally, construction materials marketed in Catalunya should include assessment of the carbon footprint on labelling [39].
- To include the need of carbon footprint in products, services and supplies during all phases of the procurement procedure, proving registration in the Carbon Footprint Registry, as established by regulations of the Junta de Andalucía [38].

Figure 10 shows some examples of measurements obtained from the analysis performed.

Life cycle	
Building design and life cycle analysis	• Adaptation to future changes of use and distribution, flexibility • Estimation of medium-long-term uses and needs • Optimization of materials in structural calculation • Calculation of the LCC to obtain total building costs
Product life cycle analysis	• Impact of products throughout entire life cycle • Manufacturing process: reduction of raw materials use and resources, waste reduction in production chains • Distribution: efficient transportation • Promotion of using tools for product LCA
Carbon footprint calculation	• Products and materials with evaluation of visible carbon footprint on labelling • Calculation of carbon footprint of products, services and supplies subject to public tender • Calculation and registration of carbon footprint in large and medium-sized companies
Productive processes	• Production processes reducing GHG emissions • Ecological production process

Figure 10. Examples of life cycle measures proposed by Spanish regional public administrations.

3.2.5. Products (Measures Related to Circular Economy)

In general, many measures were found on specific products following a circular economy model:

- To reuse materials in situ [69].
- To reuse materials from another work, recovery plant or demolition [39,67,69,88,94,96]; to take advantage of materials reusable for building renovation [70].
- To use easy-dismantling products and reusable with minimal alteration [70,88,89,97,98].
- To use recycled products—a measure proposed generically in all regions. In the Green Guide of the Comunitat Valenciana [67], a further step is taken, specifying that using recycled products for building elements reaches a certain percentage of execution cost of the work, justifying the

percentage according to the weight of recycled material in products. This guide also recommends using concrete with recycled aggregate, and includes an annex with the approximate proportion of recycled material in particular products, as well as a list of building elements and recycled materials. In this area, the Sustainable Building and Renovation Guide of the País Vasco [70] suggests that at least 25%, by weight, of raw material has recycled origin.

- To use easily recyclable end-of-life materials [69,88,97,98]. The Sustainable Building and Renovation Guide of the País Vasco [70] offers examples of potential recyclable materials easily separable in the different waste streams after removing from buildings (glass, plastics, wood, metal, stone, etc.).
- To consider components previously repaired [96] or easily repairable [99], as well as remanufactured or renewed ones to extend their useful life [49].
- To use standardized, prefabricated and/or industrialized construction products and elements, due to greater durability, CDW reduction, easy decommissioning and possible reuse [67,69]. The Sustainable Building and Renovation Guide of the País Vasco [70] contains examples of the latter.
- To use quality components and materials with easy replacement, for a maximum durability of buildings [69].
- To avoid using heavy metals due to high pollution [100], particularly in materials and coatings for roofs, facades and installations [70], since rainwater can release heavy metals to rainwater—a vehicle for pollutants.
- To use products that do not contain harmful or dangerous substances [61,69,99], such as chipboards with low formaldehyde emissions and paints that do not contain lead, chromic substances or organic solvents [70]. The Green Guide of the Comunitat Valenciana [67] recommends limiting content and emissions of harmful substances in paints, wood coatings (low VOC and formaldehyde emissions), cork and bamboo flooring, as well as sealants and adhesives.
- To use products from sustainably managed sources [69], such as sustainably managed wood [67,98,100,101].
- To use products that do not require dangerous cleaning products [69], such as ceramic tiles [67]. It is recommended to incorporate ceramic products with heavy-metal free enamels to avoid pollution of water, subsoil or air [70].
- To use products for environmental impact reduction during the different phases of life cycle, including production [69], and certified according to the ISO 14006 standard for Ecodesign [37,70,100].
- To incorporate innovative materials with environmental performance: ceramic tiles with photocatalytic effect, and with bacteriostatic, bactericidal or viricides properties [67]; floors and facade elements that capture CO2, piezoelectric materials, etc. [70].
- To use wood because of its natural, renewable and recyclable properties, with accreditation of legal origin from sustainable forest management [99]. It is advised to consider the limitation of harmful or dangerous substances, treatments against biodegradation, as well as the reaction to fire conditions according to location [68]. Preferably the use of local wood to reduce the impact associated with transportation, as well as reused/recycled whenever possible [70].
- To incorporate recycled aggregate resulting from CDW treatment to minimize the demand for raw material and waste [70,89].
- To use materials extracted and manufactured in the region to reduce environmental impact resulting from transportation [70,88].
- To use eco-products, as they comply with the eco-label criteria [69,102].
- To use products with type I environmental labels, which guarantee environmental impact reduction—a measure suggested in most Spanish regions [70].
- To use products with type III environmental labels, reporting on potential environmental impacts, and promoting transparency in the products for constructing market [67,70].

Some examples of product measurements obtained from the analysis are shown in Figure 11.

Products	
Reused	• Use of reused materials on site • Use of reused materials from another work, recovery plant or demolition • In renovation of building materials themselves
Reusable	• Incorporate with easy dismantling, for reuse with minimal alteration
Recycled	• Elements with recycled materials representing a percentage of total building elements • Recycled material content: percentage by weight (> 25 percent) • Concrete with recycled aggregate • Recycled aggregates from construction and demolition waste
Recyclable	• Use of easily recyclable materials at the end of their useful life
Lifetime extension	• Easily repairable products • Incorporate repaired components • Remanufactured or Refurbished Products • Quality materials and easy replacement to extend the life of buildings
Standardized, prefabricated and / or industrialized	• Standardized, prefabricated and / or industrialized products and elements: greater durability, reduction of waste generation on site, ease of dismantling and possibility of reuse
Sustainable	• Wood from sustainably sources
Limitation of harmful or dangerous substances	• Avoid using heavy metals due high pollution • Boards with low formaldehyde emissions • Paints that do not contain lead, chromic substances or organic solvents • Wood, cork and bamboo coverings
Easy cleaning and hygiene	• Use of products that do not require dangerous cleaning products, such as ceramic tiles (containing heavy metal-free enamels)
With environmental benefits	• Flooring and façade elements that collect CO2 • Ceramic tiles with catalytic effect • Piezoelectric materials
Proximity	• Use of materials extracted and manufactured in local places to avoid environmental impact resulting from transport
Environmental evaluation	• Products friendly to criteria set by eco-labels • Products with environmental labels (type I or III)

Figure 11. Examples of product measurement proposed by Spanish regional public administrations.

3.2.6. Waste Management Measures

A proper management of CDW is essential for a transition to circular models in the building sector. The recommendations found in this area are:

- To include public procurement in sustainable waste management strategies [97], with specific clauses promoting circular economy: reuse and recycling of waste, sustainable products, service purchase instead of product purchase, etc.
- To minimize generation of waste during construction works (with on-site reuse) and at the end of the building's life (facilitating selective deconstruction) [67,69]. To elaborate a waste management plan to identify opportunities for reuse, recycling and recovery [67,103]. Selective collection of all waste and further recovery by authorized managers. This is a requirement suggested in all regions, especially the recovery of mineral waste [70] or used products by the work contractor [88,91].
- To prepare a percentage of CDW for reuse, recycling and other ways of recovery. To do this, an audit prior to demolition is necessary to determine materials to be reused or recycled [67,103].

- Building design to favor selective demolition [69].
- To reuse stone waste and soil remains in the same work as filling material [69,70,104,105]; this measure was already stated in Decree 200/2004 of the Comunitat Valenciana [106]. It should be noted that the use of nonhazardous waste as filling material for regeneration of degraded areas (mining operations, landscaping engineering works) is considered as a recovery operation, and meets the requirements of Royal Decree 105/2008 [107].
- To reduce packaging waste: large capacity packaging [69]; reusable packaging [70,99]; packaging collection by providers for reuse or recycling [67,88]; bulk products [99], such as concrete and mortars prepared in plant; reuse pallets on site [67]; supply products in containers and dispensers [70,101].
- To promote separation of ordinary waste generated in buildings with facilities for this purpose [67].

Figure 12 shows some examples of waste-management measures obtained from the analysis.

Construction and demolition waste (CDW)	
Strategies	• Building design to favour selective deconstruction • Substitution of product purchase by service contract
Sustainable waste management during construction works	• Reduction of waste generated (reuse in situ) • Waste management plan identifying opportunities for reuse, recycling and waste recovery • Selective collection of all waste and management through authorized managers, in particular mineral waste • Reuse and recycling of waste • Reuse of stone waste and remains of land from site work as filling material • Pre-demolition and clearing audit
Reusable, recycled and bulk packaging	• Collecting containers and packaging by suppliers suitable for recovery • Supply Product supply in paper, cardboard, plastic or wood packaging, using recycled material: percentage of total products • Ready-mixed concrete prepared in plant • Mortars in dry premixed form
Waste storage	• Space in buildings for ordinary waste separation

Figure 12. Examples of construction and demolition waste (CDW) management measures proposed by Spanish regional public administrations.

3.2.7. Environmental Assessment and Monitoring Measures

In this area, some recommendations found are the following:

- To request an environmental management plan for work execution. This should consider water accounting and energy consumption, as well as a calculation of CO2 emissions associated with material and transportation, even a minimization of impacts on the close environment (noise, dust, dumping, damage to vegetation, etc.) [69,70,88,100]. Actions to avoid those impacts can be washing vehicle wheels, land watering or shielding works [70].
- To prepare specific documentation containing all the environmental measures of the project to ensure implementation during the construction phase [70].
- To install sectorized meters for different networks (water, electricity and/or gas supply) and circuits (lighting, plugs, exterior lighting, etc.) to test the effectiveness of the project's environmental measures [69].

3.3. Application of Environmental Measures in the GPPRB: Examples

As mentioned above, the tenders incorporating environmental measures with relevance in award criteria are still insufficient [14]. However, both in the EU and Spain, there are many success cases in which these measures are defined and valued. Below, three examples of good practice in Spanish regions are described:

- Refurbishment of the façade in a warehouse converted into a youth center in Alzira, Comunitat Valenciana [108]: in the tender, the adoption of comprehensive solutions was established as a priority criterion, as well as a demonstration of energy efficiency and LCC, by using common verification tools for all participants. Based on a theoretical starting solution, each bidder was asked to prove the energy performance improved on the solution proposed. Compared with the baseline model, the solution contracted for this refurbishment showed a 15% reduction in heating demand (from 63 to 54.6 kWh/m2 per year) and a 19% reduction in cooling demand (from 34.1 to 27.5 kWh/m2 per year). Furthermore, the determination to sustainably renovate an existing building rather than undertake a new construction also reduced CDW and raw material extraction. The tender emphasized the ease and low-energy intensity of maintenance as well as material guarantees, therefore minimizing future costs.
- Energy self-sufficient hospital in Ourense, Galicia [109]: the main challenge for the contracting body was to optimize energy consumption in the extension of the existing hospital. For this, two complementary tenders were called, focused on both improving the energy facilities and the software monitoring energy management system. The main award criteria used were based on the performance of the energy equipment proposed (electrical and thermal), CO2 emissions produced by facilities, electrical efficiency of the cogeneration engine, thermal efficiency of the biomass boiler, as well as chiller absorption.
- Refurbishment of the town hall building in Amorebieta-Etxano, País Vasco [110]: prior to the tender, the City Council commissioned a preliminary study to analyze three possible scenarios: complete refurbishment, partial reform or new construction. It was concluded that the best option was the first one but maintaining the original two-story structure and adding a third one. The criterion for this choice was the saving of 20% of resources, compared to the new construction. Based on these results, the City Council launched the tender, taking into account "sustainability criteria, thermal and light comfort and a building integration in urban landscape", among others. The successful tenderer designed and built a building with a high environmental sustainability rating, according to the building rating system in the País Vasco. Some of the environmental measures to favor this rating were: maintenance of the main facade; reuse of materials from the building itself according to the concept "cradle to cradle" or "the best product is the one that is already there". For this, a selective demolition of the building was carried out for material recovery, such as stone.

In the three examples, the valuation of environmental measures on other criteria was much higher than 10% of the current EU average, as mentioned in the introduction.

4. Discussions

From the analysis of the source information on energy efficiency and circular economy in the GPPBR within Spanish regions, a series of questions arise about barriers to application and opportunities for improvement.

4.1. Are All the Measures Feasible? Is the Sector Well-Prepared?

In the measures analyzed themselves, barriers to application of different kinds are observed.

In the case of passive energy efficiency measures, there might be difficulty in implementing them in building renovation. Notably, bringing in thermal insulation or solar shadings in facades as well as renewable energy facilities on roofs may be restricted by municipal regulations. Therefore, local

regulations should be modified, based on higher ranking guidelines and standards. For example, the Decree-Law 16/2019 [111] of Catalunya provides the placement of facilities for solar energy on roofs of existing buildings. For that purpose, specific terms were imposed, with no limitation of urban plan requirements.

Regarding renewable energies, there is controversy over the technical solvency criterion referring to the fact that electric power trading companies have the A label issued by the CNMC. This requires the electricity marketed to be of 100% renewable origin [112]. On the other hand, in order to make energy 100% renewable by 2050, not only the technology and price reduction are needed, but also political will. Regarding decarbonization in the Spanish building sector, it is essential to increase the level of electrification in energy demand, and prioritize renovation.

It is found that there are not very many measures related to the life cycle analyses, although these are vital to optimize results [3,4]. Furthermore, carrying out the LCC requires experience and competence. However, the sector appears not to have fully matured [69].

In relation to gray water reuse systems, these demand the installation of a treatment tank. Therefore, the practical application of this measure can be conditioned by available space [70].

Additionally, barriers caused by shortcomings in the construction product market itself are detected. In the case of products using recycled material, raw materials can have a lower cost. This is due to the additional costs of dismantling, separating and transforming the waste. On the contrary, there are no additional charges on raw materials extraction or CDW disposal in landfill. This last issue should be tackled, as specified in the Galicia Circular Economy Strategy 2019–2030 [94], although this measure is planned to be implemented in some regions [99].

With reference to concrete using recycled aggregate, there might be a lack of production and supply in the vicinity of the work or the region itself. Besides, the CDW recovery plants might not exist to manufacture recycled concrete aggregate in the concrete plant environment. In view of these conditioning factors, environmental impacts of transportation can exceed the benefits achieved through the measure itself [67]. The drawbacks might come up in relation to sustainable products, such as products using recycled material, sustainably managed wood, industrialized components, etc. For this reason, it is advisable to check availability in the environment around the site work before ordering in the contracting specifications.

There are also other scarce and scattered products on the market, such as eco-products guaranteed by Type I eco-labelling. To make their demand feasible in the GPPBR, it would be necessary to create an updated registry of sustainable products to easily identify companies [67] that market them. In addition, the continuous evolution of the market makes it necessary to permanently review measures related to eco-products, reused or renewed products. There may even be regulatory changes such as the introduction of requirements on recycled content in the Regulations for Construction Products [3].

There are also difficulties in collection by suppliers of products, containers and packaging for reuse or recycling. This measure requires the product supplier to guarantee logistical facilities for reuse or recycling. If not, the supplier should deliver waste to an authorized manager. However, this practice can increase environmental impact due to transportation.

Finally, bringing in reused products with a short useful life can cause negative effects, since this implies an early replacement or repair. Thus, to propose this measure, useful life of products in their new use should be considered.

4.2. How to Apply the GPPRB in the Rehabilitation of Historic Buildings?

To the difficulties mentioned above, some limitations must be added in interventions within historic buildings. In this case, instead of indiscriminately applying criteria established in the GPP, the contracting bodies should draw up a detailed study of each building requiring, if appropriate, advice. In general, feasible measures should be implemented, with flexibility in case they conflict with the essence of the building itself and, if appropriate, compensate with additional measures. Likewise,

communication between all those involved in the rehabilitation should be fostered in order to better integrate environmental criteria.

4.3. Does Public Procurement Itself Favour Sustainability and Innovation? How to Increase the Participation of Small and Medium-Sized Enterprises (SME)?

Barriers are also observed in the technical terms proposed in procurements, which prevent environmental criteria from having a greater impact on proposal evaluation. Therefore, it may be appropriate to increase the relevance of these measures in valuation criteria, so that the total cost is not higher than 50%, so as not to be decisive for tenders.

On the other hand, as shown in the results, a greater impulse of the GPPRB is achieved when environmental measures are mandatory through normative provisions. To this effect, it is necessary that measures are linked to the subject of procurements, and clearly defined in procedures.

In the current frame of economic recession, SMEs are the driving force for the economy [113]. So as to prevent SMEs from being left out of larger procurement, and consequently limit the number of lots awarded to the same company, procurements can be divided into batches. Likewise, to contribute to economic development and job creation in regions during procurement execution phase, it is advisable to invite regional SMEs involved in the innovation sector linked to sustainability [113]. In this sense, to promote the public procurement of innovative solutions, various Administrations should provide support to companies and research institutions, able to provide technological solutions or advice on innovation.

4.4. Do Public Administrations Meet Their Own Challenges?

Public procurement opens up a great opportunity to renovate buildings according to principles of energy efficiency and circular economy. Additionally, this task is complex, time passes and not all administrations seem to keep up with the ambitious goals set. Generally, an administration efficient enough to speed up long procurement processes is needed.

Regarding the improvement of the GPPBR, the Administration can undertake actions in nearly all areas: information, coordination and monitoring, training, awareness, dissemination, as well as financing (Figure 13).

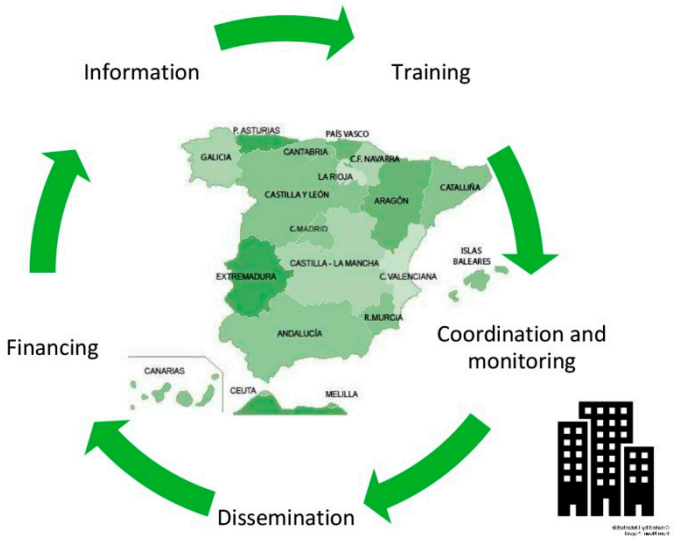

Figure 13. Actions of the Administration to improve the GPPBR in Spanish regions and autonomous cities (Map of Spain obtained from: Ministerio de Agricultura, Pesca y Alimentación; icon attribution: buildings by Untashable from the Noun Project).

4.4.1. Is There Quality Technical Information to Guide the GPPBR?

Generally, the information source found is scattered in different documents, and there are few specialized guides in the GPPBR. Due to this, it is vital to draft specific guides for an easy and feasible incorporation of environmental measures in the GPPRB, according to the type of building (teaching, administrative, health, etc.).

The proposed measures should be well-defined to clearly understand how they can be met and verified in the different phases of the GPPBR. With regard to the latter, some guides mentioned above [67,69] already include more precise and detailed information. Furthermore, with a better definition, consultations or revisions that might lengthen procedures could be avoided [114].

It would be very useful if measures had associated indicators, objectives or guidelines, such as value for money, cost-effectiveness, impact on the total cost of investment, savings generated, technologies involved, implementation period, number of citizens affected, etc. In this way, there would be criteria to bring in measures according to the type of work. Additionally, product performance suggested should be linked to its final functionality, for example photocatalytic effect, bactericidal or bacteriostatic surfaces, etc.

In order to become more functional, measures should include references to web sites or other guides for further information, and also a provision of good practices with real cases of application. It would also be desirable to connect measures with supplying companies that could evaluate practice and generate an "e-marketplace". In addition, to facilitate the implementation of GPPBR measures in small towns, regional administrations should draft sheets with practical, useful and schematic information to help suppliers make decisions, all based on a Think Tank for each municipality. If the contracting body did not have sufficient resources, it could hire a consulting service to better define measures according to the type of building, needs, environmental commitment or relationship between environmental benefits and economic costs.

In general, with regard to viability of environmental measures related to products, it is essential to know in advance the regional market in terms of construction products, especially the innovative ones. Furthermore, innovative measures need to enable better solutions with optimized costs [115]. For example, in the PPI strategy of the Junta de Andalucía, public tender processes are highlighted to promote start-up markets [116]. Likewise, progress should be made in research to propose the most effective measures considering the life cycle approach, and thus find optimal solutions in building renovation. For example, Level (s) is the EU tool recommended for integrating life cycle assessment into GPP [3]. Moreover, given the growing number of certification systems for building sustainability, they could be regarded as a reference.

Finally, it would be practical to have digital guides for updating and improving measures on a regular basis. In addition, it would be very convenient to add monitoring and inspection of environmental measures to procurements. In this connection, effectiveness and implementation could be easily verified, as well as identifying shortcomings that can improve environmental performance.

4.4.2. From Theory to Practice: Is There Sufficient Coordination among Public Administrations? How to Detect if Tools Are Being Applied?

To increase effectiveness of actions, joining forces is essential, along with coordination by different administration departments, and the different administrations, as well as implementing the monitoring of actions realized.

Because of the political organization of Spain at a territorial level, a large part of the definition in the programs for GPP, implementation and monitoring is performed by the regions themselves. This decentralization enables regional administrations to draw up laws, regulations and guides within the state regulatory framework, resulting in a large amount of documentation, as mentioned above. This requires well-trained professionals and a high level of organization. For this reason, and due to the different resources of regions, greater collaboration and coordination between these and the State should be desirable. Certain aspects of the GPPBR could be addressed centrally: for example, by setting

up a national agency in which all regions were represented to support procurement authorities through guidance, training, and documentation as a common reference, especially guides. Based on them, regional administrations could draw up additional papers to address specific aspects of each area, if necessary. Thus, these tools could enhance the different regional economic bases, support specialization of various productive sectors and favor local products.

On the other hand, within the scope of the General State Administration, an interministerial commission was set up to bring criteria into the GPP [35]. In the same vein, it is necessary to create an interdepartmental committee for each region, in order to coordinate the onboarding of ecological criteria, development of strategies for GPP and monitoring.

With the aim of detecting the degree of implementation of the GPP goals and execution of actions, an annual monitoring concerning the application of environmental measures in the public procurement awarded should be carried out [89,117]. For this purpose, the interdepartmental committee should add results provided by departments for the GPP, with results provided in a standardized format or use platforms and tools for integration [118,119].

Regarding specific measures, for environmental enhancement check-up during the use phase of the building, actions such as checking consumption or conducting a survey for building users to analyze the perception of comfort should be undertaken [70]. A key factor in the environmental impact of buildings is energy use during occupation. The monitoring of CDW management would be required, since waste traceability is lost due to proliferation of illegal dumping [120].

4.4.3. Is There Enough Training for Professionals to Be Qualified?

One of the main problems detected for measure implementation is a lack of training for all professionals involved in the GPPBR process. Given the novelty and complexity of the subject, particularly in aspects related to the circular economy, it is needed to boost actions for an exchange of technical knowledge. Staff training in environmental criteria is one of the first steps to increase their incorporation into contracts.

For all this, training plans on environmental measures should be proposed, as well as tools developed, as part of procurement documents, including cases of good practice. In particular, emphasis is needed on the relevance of specific energy training plans and eco-labelling product presentations, given that both construction companies and designers should familiarize with these [41,69]. Training administration staff in the "Building Information Modeling" (BIM) work methodology is essential. This methodology is a requirement for public funding projects. At the State level, an Interministerial Commission was created for bringing BIM methodology into public procurement [121].

4.4.4. Are We All Sufficiently Involved?

A solid communication plan of actions carried out in the GPPBR can maximize impacts, by setting up web platforms to ensure visibility of hiring. Thus, the EU GPP Good Practice [122] platform presents success stories, in which improvements are emphasized, which is a feature inspirational for their replicability.

Likewise, in order to gain complicity of citizens, tools should be created to communicate the beneficial effects of the GPP. For example, an information panel could be displayed on energy efficiency actions, renewable production and other circular economy measures applied [37]—the same as in certain public buildings, where it is mandatory to display energy efficiency labelling [123]. Occupants in buildings could also receive information on carbon footprint over their lifetime, by installing automated systems to obtain data on electricity use, air quality and building waste production. All this leads to awareness raising on environmental impacts generated by buildings and behavior-correction, where appropriate. Additionally, user participation tools can be implemented in the phases of planning, execution and evaluation of the projects, as contributors to needs and ideas [109]. This direct involving encourages a greater acceptance of the results of the GPPBR.

4.4.5. Is Sufficient Funding Planned?

Faced with the serious social and economic crisis caused by the COVID-19 pandemic, in order to access the EU reconstruction funds, we come across both the constraint and opportunity that "the recovery is green". This implies that part of the EU aid must be invested in actions of the Green Deal to combat climate change and achieve the EU decarbonization objective from the present to 2050.

5. Conclusions

Scientific literature indicates that the GPPBR represents an opportunity to implement environmental policies in a prominent activity such as public procurement in construction—a key economic sector in Spain. However, this analysis concludes that the inclusion of environmental measures in public procurement for building rehabilitation is low, and the total costs continue to be weighted much higher than environmental criteria. Among the possible causes of this scenario, various studies note a lack of knowledge of parties involved, because of the absence of practical information, among other reasons.

Taking the State regulatory framework as a reference, Spanish regional administrations within respective competencies draw up laws, regulations and guides on GPP, climate change, environment, energy efficiency, circular economy, waste and innovation. By analyzing this documentation, it was possible to collect a large amount of information in the form of environmental measures to bring in the GPPBR specifications. It is worth noting the difficulty in finding specific and quality information on environmental measures to be incorporated into the GPPBR. Most instruments refer to GPP generically.

The study shows the need to develop advanced technical procedures. It is evident that these should compile ecological measures to put into practice in the GPPBR with a required level of definition. This way, the agents involved will understand how to comply with them and verify in the different phases of tender procedures. From the information consulted, the great support found in references to real cases of good practice, and even specific guides for further information is remarkable. It is also noted that if measures were associated with indicators, contracting authorities could add to them with better criteria. In addition, the information on the feasibility of applying measures is a key factor, since there might be barriers that should be detected before being proposed in the tender specifications.

It is found that the Administration plays a vital role in promoting the GPPBR. There can be no doubt that environmental measures are incorporated, and monitoring is carried out when there are regulatory provisions that comply with them. Additionally, with greater collaboration and coordination between regional administrations and the State, there would be sufficient resources to develop the mentioned technical procedures, especially guides. These could serve as a reference for regions to adapt to their specific features. Once information on environmental measures has been gathered in the GPPBR, it is essential to make this widely known to professionals and provide awareness and dissemination campaigns for everyone.

Based on this approach to environmental measures includible in the GPPBR, the necessity of future research is significant. A detailed study could be made on environmental measures in the procurement specifications of regional public administrations, as well as their assessment. It is also considered worthwhile to identify what the most effective strategies are after application, with an analysis of the results. Delving into research on good practice examples is always encouraging to promote further initiatives. Likewise, it is possible to deepen the analysis of life cycle costs of existing products on the market regarding building renovation, as well as the development of innovative products. Eventually, an in-depth investigation should be carried out on the real impact of GPPBR environmental measures on the reduction in environmental consequences caused by the constructing sector in Spain.

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Appendix A

Table A1. Papers relating to the GPPBR developed by regional Public Administrations.

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
Andalucía	**L**	• Law 8/8 October 2018, on measures to combat climate change, for transition to a new energy model in Andalucía. • Draft on Circular Economy Law in Andalucía. 2020.
	R	• Decree 169/31 May 2011, approving the Regulation for the Promotion of Renewable Energies, Savings and Energy Efficiency in Andalucía. • Andalucía Circular Bioeconomy Strategy (approved by Agreement of the Governing Council on 18 September 2018). • Public Procurement Strategy for Innovation in the Public Administration of the Junta de Andalucía (approved by Agreement on 4 September 2018). • Andalucía 2020 energy strategy (approved by Agreement on 27 October 2015). • Action Plan 2018–2020 for the Andalucia Energy Strategy (approved by the Evaluation Body of the Ministry of Employment, Business and Commerce on 17 December 2018). • Agreement 18 October 2016, by the Governing Council, promoting the incorporation of social and environmental clauses in the contracts of Andalucía. • Draft Decree approving the Comprehensive Waste Plan for Andalucía. Towards a Circular Economy in the Horizon 2030 (PIRec 2030).
	G	• Basic Project Guides (Greens). Horizon 2020. 2018. • Guide for good practice in green public procurement (final result of GPP4 Growth Activity 1.2 within the Interreg Europe program). 2017. • Guide for the inclusion of social and environmental clauses in the Junta de Andalucía procurement 2016.
Aragón	**R**	• Decree 46/1 April 2014, by the Government of Aragón, regulating actions in the field of energy efficiency certification in buildings and creating registration within the Region of Aragón. • Order HAP/522/7 April 2017, publicizing the Agreement on 28 March 2017, by the Government of Aragón, adopting measures for the strategic use of public contracts in support of common social objectives and deficit reduction in the Autonomous Community of Aragón. • Circular Aragón strategy. 2020. • Aragón Climate Change Strategy. Horizon 2030. 2019. • Aragón Energy Plan 2013–2020. 2014.
	G	• Green purchasing. Green Public Procurement and Contracting. 2nd Catalog of criteria, products and suppliers. 2009. • Guide for good environmental practice in contracting by public administrations. 2004.

Table A1. *Cont.*

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
Islas Canarias	**L**	• Draft for the Islas Canarias Climate Change Law. 2020. • Prior public consultation on the Circular Economy Law of the Islas Canarias. 2020.
	R	• Islas Canarias Energy Strategy 2015–2025. 2017. • Draft for the Integral Waste Plan in the Islas Canarias.
	G	• Sustainable public procurement and procurement guide by the Islas Canarias Government.
Cantabria	**R**	• Decree 75/23 May 2019, establishing general policy guidelines on the incorporation of social criteria and clauses in contracting the public sector in Cantabria. • Decree 32/12 April 2018, approving the Action Strategy against Climate Change in Cantabria 2018–2030. • Decree 14/23 March 2017, approving the Waste Plan in Cantabria 2017–2023. • Decree 35/10 July 2014, approving the Energy Sustainability Plan of Cantabria 2014–2020.
	G	• Guidelines for energy efficiency: Public services. 2013.
Castilla La Mancha	**L**	• Law 7/29 November 2019, on Circular Economy in Castilla-La Mancha. • Law 1/2007, 15 February 2007, on the promotion of Renewable Energies and Incentive Plan for Energy Saving and Efficiency in Castilla-La Mancha.
	R	• Decree 78/2016, 20 December 2016, approving the Integrated Waste Management Plan for Castilla-La Mancha. • Decree 29/2014, 8 May 2014, regulating actions regarding certification of energy efficiency in buildings in Castilla-La Mancha and creating the Regional Registry for Energy Efficiency Certificates in Buildings of Castilla-La Mancha. • Order 4/18 January 2019, by the Ministry of Agriculture, Environment and Rural Development, approving the Climate Change Strategy in Castilla-La Mancha, Horizons 2020 and 2030. • Resolution 19 October 2016, by the General Secretariat for Finance and Public Administrations, which provides for the publication of the Instruction of the Governing Council 18 October 2016, on social clauses, gender and environmental perspective in contracting the regional public sector.
	G	• Relevant contributions to energy saving and efficiency in buildings by local administration. 2018. • Social and environmental criteria in public procurement (Federation of Municipalities and Provinces Castilla-La Mancha). 2010.

Table A1. *Cont.*

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
Castilla y León	**I**	• Decree 11/20 March 2014, approving the Regional Plan of Sectorial Scope called "Comprehensive Waste Plan of Castilla y León" • Agreement 26/4 June 2020, by the Junta de Castilla y León, approving measures against climate change within Castilla y León. • Agreement 2/18 January 2018, by Junta de Castilla y León, approving the Energy Efficiency Strategy of Castilla y León 2020. • Agreement 128/26 November 2009, by the Junta de Castilla y León, approving the Regional Strategy against Climate Change 2009–2020. • Proposal for Circular Economy Strategy in Castilla y León 2020–2030 (processing public information).
	G	• Practical guide on bioclimatic construction solutions for present architecture. Castilla y Leon meeting. 2015. • Photovoltaic solar energy guides. EREN. 2013. • Green buying guide. University of Valladolid. 2007.
Catalunya	**L**	• Law 16/2017, on climate change.
	R	• Decree Law 16/2019 on urgent measures to face climate emergency and the promotion of renewable energies. • GOV/55/2020 Agreement, 31 March, approving the objectives and minimum content of the Catalunya Public Procurement Strategy. • Agreement GOV/84/11 June 2019, to promote strategic public procurement for innovation in the Administration of the Generalitat de Catalunya and public sector. • According to the Government of Catalunya, approvement of the Energy Efficiency and Saving Plan in buildings and facilities, Generalitat de Catalunya (GENERCAT), in the energy transitional framework in Catalunya, 2018–2022, 4 December 2018, period 2018–2022, 4 December 2018. • Strategy to Promote Green Economy and Circular Economy by the Government of Catalunya (approved by Government Agreement GOV/73/26 May 2015). • Catalunya strategy for energy renewal in buildings (ECREE) (approved by the Government's cord on 25 February 2014). • Catalunya ecodesign strategy for a circular and eco-innovative economy (2014). • Catalunya 2020 general waste and resource prevention and management program (PRECAT20).
	G	• Guide for the drafting of provisions of particular administrative specifications and technical requirements on energy performance contracts under guarantee provisions, subject to harmonized regulation (service contracts). 2018. • Col·lecció Quadern Pràctic (technical reference guides for professionals in energy sector). • GPP 2020 project. Procurement for a low-carbon economy. Final Results. 2016.
Ceuta	**R**	• Public cleaning and waste management ordinance. 2020. • Ecological action plan to improve environmental quality (under preparation).
	G	• Works Inspection Guide.

Table A1. *Cont.*

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
Comunidad de Madrid	**L**	• Draft Law on Climate Change and Energy Transition.
	R	• Resolution 5 March 2020, by the President of the Administrative Contracting Advisory Board, providing adjustments in the models of specifications, in particular administrative clauses of general application informed by the Administrative Contracting Advisory Board. • Sustainable Waste Management Strategy for the Comunidad de Madrid 2017–2024 (Approved by Agreement 27 November 2018). • Agreement 3 May 2018, by the Governing Council, establishing the reservation of public contracts in favor of entities of social economy and promoting the use of social and environmental clauses in public procurement within the Comunidad de Madrid. • Air Quality and Climate Change Strategy of the Comunidad de Madrid (2013–2020). Blue Plan + (approved by Order 665/3 April 2014). • Energy Saving and Efficiency Plan in Public Buildings in the Comunidad de Madrid. 2017. • Energy Plan of the Comunidad de Madrid Horizon 2020.
	G	• General Guide on Environmental Aspects for companies. Comunidad de Madrid. 2020 review. • MADRID7R Circular Economy Campaign. Comunidad de Madrid. 2017. • Frequently asked questions and quick answers for a Responsible Public Procurement. 2017.
Comunitat Valenciana	**L**	• Draft of the Valencia Law on Climate Change and Ecological Transition. • Decree-Law 14/7 August 2020, by the Consell de la Generalitat, on measures to stimulate the establishment of facilities for the use of renewable energy due to climate emergency and the need of urgent economic recovery.
	R	• Decree 55/5 April 2019, by the Consell, approving the revision of the Integral Waste Plan in the Comunitat Valenciana. • Decree 39/2 April 2015, by the Consell, regulating certification in energy efficiency in buildings. • Decree 200/1 October 2004, by the Consell de la Generalitat, regulating the use of suitable inert waste in restoration, conditioning and filling works, or construction purposes. • Order 19 October 2004, by the Ministry of Territory and Housing, on environmental requirements and criteria to be introduced in administrative clause specifications governing contracts of the Ministry of Territory and Housing, autonomous entities and public law entities—linked or dependent. • Agreement 16 December 2016, by the Consell, approving the Plan for energy saving and efficiency, promotion of renewable energies and self-consumption in buildings, infrastructures and equipment in public sector of the Generalitat Valenciana. • Valencia Strategy for Climate Change and Energy 2030. 2020.

Table A1. *Cont.*

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
	G	• Green Guide, environmental measures in public procurement in the field of Constructing. Generalitat Valenciana; IVE, 2020. • Guide on circular economy. Making the Circular Economy Work. Guidance for regulators on enabling innovations for circular economy (prevention and waste recycling). 2019. • Passive design strategy guide for buildings. Forum for sustainable building. Comunitat. • Valenciana, IVE 2014. • Guide for the incorporation of renewable energies in buildings. Forum for sustainable building Comunitat Valenciana, IVE 2012. • Procedure to Promote Public Procurement of Innovative solutions (PPI).
Extremadura	**L**	• Law 12/26 December 2018, regarding socially responsible public procurement in Extremadura.
	R	• Decree 115/24 July 2018, regulating actions on energy efficiency certification of buildings Extremadura, creating the Registry for Certifications of Energy Efficiency in Buildings. • Resolution 25 February 2016, by the Counselor, providing publication of the Agreement by the Governing Council of the Extremadura Regional Government, 23 February 2016, approving the Instruction for incorporating social and environmental criteria, promotion of SMEs and promotion of sustainability in public procurement of the Junta de Extremadura and public sector entities. • Instruction 01/2020 on processing self-consumption facilities in Extremadura. • Energy efficiency strategy in public buildings of Extremadura Administration 2018–2030 (approved by the Governing Council on 28 November 2018). • Extremadura Climate Change Strategy 2013–2020 (approved by the Governing Council on 4 January 2014). • Green and circular economy strategy Extremadura 2030. 2018. • Extremadura Integrated Waste Plan 2016–2022. (approved by Agreement of the Governing Council, 28 December 2016). • Draft for the Extremadura Integrated Energy and Climate Plan 2021–2030. 2018.
	G	• Models of specifications for public works, supply and service contracts. Junta de Extremadura. 2019 and 2020.
Galicia	**L**	• Law 14/2013, December 26, for rationalization of autonomous public sector.
	R	• Decree 130/3 October 2019, approving the Interdepartmental Commission for Promotion and Coordination of the Galicia Strategy for Climate Change and Energy 2050. • Decree 128/2016, regulating energy certification of buildings in Galicia. • Galicia Strategy for Climate Change and Energy 2050 (spproved by the Council of the Xunta de Galicia on 3 October 2019). • Integrated Regional Plan for Energy and Climate 2019–2023 • Energy Saving and Efficiency Strategy in the Autonomous Public Sector of Galicia 2015–2020. • Galicia circular economy strategy 2019–2030.

Table A1. *Cont.*

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
	G	• Guide for good practice to favor Public Procurement of Innovative solutions in Galicia. 2016. • Guide for a socially responsible public procurement in the Galicia public sector.
Illes Balears	**L**	• Law 10/22 February 2019, on climate change and energy transition. • Law 8/19 February 2019, on waste and contaminated land of the Illes Balears.
	R	• Instruction for socially responsible and environmentally sustainable contracting in the Insular Council of Menorca. 27 October 2018.
La Rioja	**R**	• Agreement on the integration for environmental aspects in public procurement of La Rioja Administration, Delegate Commission of the Government of Acquisitions and Investments, 28 February 2003. • La Rioja Energy Plan 2015–2020. • Strategic approach for energy policy 2015–2025. • Local Plan 21 Action Plan in La Rioja. • Bases for Sustainable Development Strategy 2020–2025.La Rioja. • La Rioja Waste Master Plan 2016–2026.
	G	• Public Procurement of Innovative solutions. Government of La Rioja.
Melilla	**R**	• Agreement by Honorable Assembly, 29 October 2019, regarding climate emergency in the Autonomous City of Melilla. • Ordinance for the Protection of Public Spaces in Relation to Cleaning and Waste Removal. • Regional operational program ERDF of the Autonomous City of Melilla 2014–2020.
Navarra	**L**	• Regional Law 2/13 April 2018, on Public Contracts.
	R	• Navarra climate change roadmap. 2017–2030–2050. • Navarra Energy Plan. 2030 Horizon. • Developing Plan for Circular Economy in Navarra 2030—Actions. • Navarra Waste Plan 2017–2027.
	G	• Responsible purchase. Region of Navarra. Environmental Clauses

Table A1. *Cont.*

Regions		Papers: Laws (L), Regulations (R) and Guides (G)
Pais Vasco	**L**	• Law 4/21 February 2019, on Energy Sustainability of the Pais Vasco.
	R	• Decree 25/26 February 2019, concerning energy efficiency certification in buildings in the Pais Vasco, control and registration procedure. • Recommendation 2/21 June 2018, on public procurement advisory board. Government of Pais the Vasco. Purpose: environmental clauses in public procurement. • Climate Change Strategy 2050 of Pais Vasco. • Euskadi Energy Strategy 2030. • Euskadi Circular Economy Strategy 2030. • Waste prevention and management plan for the CAPV 2020.
	G	• Environmental Criteria. 4.17. New construction of administrative and office buildings. Ihobe, Government of País Vasco. • Environmentally sustainable building guides, Ihobe, Government of País Vasco. 2010. • Sustainable building and renovation guide for housing in PaisVasco. 2015. • Public Procurement of Innovative solutions. Proposal paper. Ihobe. Government of País Vasco. 2016.
Principado de Asturias	**R**	• Agreement 16 November 2017, by the Governing Council, declaring Public Procurement of Innovative solutions as strategic objective for the Principado de Asturias Administration, creating the Commission for promoting public purchase of innovation. • Sectoral measures to combat climate change in the Principado de Asturias. • Setting-up the Joint Commission to evaluate impact of energy transition in the Principado de Asturias. Executive paper. Current situation, forecast and recommendations. October 2019. • Asturias Paradise Hub 4 Circularit. Economic Development Agency of the Principado de Asturias. • Strategic waste plan for the Principado de Asturias 2017–2024. • Agreement on 16 November 2017, by the Governing Council, declaring Public Procurement of Innovative solutions as strategic objective for the Administration of the Principado de Asturias and creating the Commission for promoting Public Procurement of Innovative solutions. • Public Procurement of Innovative solutions. Economic Development Agency of the Principado de Asturias (IDEPA).
	G	• Preliminary Need File for the project on Public Procurement of Innovative solutions. Government of the Principado de Asturias. • Practical guide for including social and environmental responsibility clauses in administrative contracting of the Principado de Asturias Administration and public sector. Governing Council Agreement, 3 May 2018.
Región de Murcia	**R**	• Strategy for mitigation and adaptation to climate change in the Región de Murcia. • Table of contents on circular economy strategy in the Región of Murcia (ESECIRM) 2017–2030. Draft. • Energy Plan. Región of Murcia 2016–2020. • Waste Plan for the Región of Murcia 2016–2020. • Research and Innovation Strategy for Smart Specialization 2014–2020.

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