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Enhancing the role of timber through green public procurement (GPP): Establishing a framework and list of products and services for the Irish construction industry

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ABSTRACT: Green Public Procurement (GPP) is an increasingly popular environmental policy tool being implemented across EU to meet carbon reduction targets. GPP could be leveraged to promote the use of timber through several different avenues in the procurement process. This paper establishes a framework as part of a holistic overview of procurement and how different decision steps in procurement are influenced. In addition, the paper also identifies different list of products and services used by the public authority (PA) in the Irish construction sector. The identified products and services offer opportunities to reduce the environmental footprint of public infrastructure projects while simultaneously improving energy efficiency, resource conservation, and social equity. The paper identifies the use of GPP to promote green criteria, ecolabels, certification targets, lifecycle assessment (LCA) and various other steps associated with greener procurement may help promote the use of timber in construction. By promoting the use of sustainable products and services, GPP can contribute to reducing greenhouse gas emissions, improving energy efficiency, and minimizing the environmental impact of construction activities. The outcome of this study aims to empower decision-makers with a toolkit for fostering a sustainable built environment aligned with global environmental goals.

KEYWORDS: *Green Public Procurement, Circular Economy, Timber, Construction, Policy*

1 – INTRODUCTION

Green Public Procurement (GPP) is a policy tool aimed at reducing the environmental impact of government purchasing, and it is crucial for achieving environmental policy objectives. It is defined as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" [1]. GPP is being implemented across numerous nations, particularly within the European Union (EU), to leverage government purchasing power and influence industry practices. In 2021, the construction industry, which represents a significant portion of public expenditure, contributed 5.5% to the EU's gross domestic product [2]. The aim of the study presented in this paper is to investigate how a green public procurement policy can be strategically influenced to promote the use of timber products in Ireland's construction industry.

In the context of Ireland, GPP is of vital importance to achieve the goals of Circular Economy (CE) as set in the Climate Action Plan[3]. Therefore, it is crucial to explore the recommendations for incentives and policy changes that can improve the efficacy and impact of GPP in Ireland, specifically in relation to CE principles and the reduction of Embodied Carbon using Life Cycle Assessments (LCAs) and Environmental Product Declarations (EPDs). To achieve this, a systematic literature review was conducted to examine existing research and identify the most effective strategies and policy changes for incentivizing and enhancing GPP in

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the context of CE and Embodied Carbon (EC) reduction in Ireland. Subsequently a list of services and products is developed to identify the commonly procured items by the public authorities, which could be bought under the policy of GPP.

The first aspect of the project is to carry out a literature review on GPP and understand the implementation gaps. A generalized framework will be developed to examine GPP from a wider systems perspective. This framework aims to evaluate different pathways through which the use of timber can be facilitated through GPP. In addition, the study identifies potential products and services for purchasing under GPP in Ireland, with a particular focus on public infrastructure projects that local authorities can directly impact. The identification of these products and services is based on an extensive literature review, analysis of existing GPP framework, and a thorough analysis of sustainability criteria, including environmental impact, energy efficiency, resource conservation, and social equity. The outcome of this study aims to empower decision-makers with a toolkit for fostering a sustainable built environment aligned with global environmental goals.

This paper is structured as follows: the methodology section outlines the rationale for the framework and the key variables under investigation. The subsequent results and discussion section presents a critical evaluation of the findings. Finally, the conclusion highlights the broader implications of the study, acknowledges potential limitations, and identifies directions for future research.

2 –METHODOLOGY

The aim of this paper is to develop a generalised framework for GPP in order to establish comprehensive value chains for timber products, thereby enhancing their integration into green public procurement policies.

In order to establish a framework, a systematic review literature review needs to be undertaken to understand the various variables affecting procurement process. Ahmed et al [4] have carried out an extensive review on the topic and have delved into the different variables for GPP. However, the framework itself was adopted from a similar work by Cheng et al. [5] who considered various factors that affect the tendering process.

In order to establish the framework, Ahmed et al [4] had narrowed down the different factors affecting the procurement decision to three key variables: human behaviour, policy drivers and availability of resources. These decisions attributes may vary depending on the project; however, the generalised framework offers insight into the attribute will most likely affect a decision. In addition, the generalised framework goes a step further to define the different pathways a traditional procurement and a “green procurement” would take.

Furthermore, the methodological approach adopted for preparing a list of potential products and services for purchasing under Green Public Procurement (GPP) in Ireland, focusing on Public Infrastructure Projects that Local Authorities and the Department of Education can directly impact through the adoption of Green Public Procurement Criteria. The methodology emphasized a multi-pronged approach, encompassing literature review, stakeholder engagement, and expert analysis.

The review identified best practices and guidelines for green public procurement, particularly in the construction sector, with a focus on sustainable building materials and practices. It also highlighted the importance of considering life cycle assessments and environmental impacts of products and services.

The comprehensive analysis identified a total of 106 products and 12 services that meet the criteria for inclusion in the GPP inventory, with a significant proportion related to timber-based construction solutions. This diverse range of GPP-compliant offerings encompasses innovative engineered wood products, sustainable forestry services, and advanced timber construction techniques, reflecting the growing importance of wood as a renewable and low-carbon building material. The inclusion of these timber-centric products and services in the GPP inventory aligns with Ireland's national objectives to increase the use of home-grown timber in construction and to decarbonize the built environment sector. This selection process not only supports the government's procurement requirements for safe and sustainable products but also promotes the broader adoption of timber as a primary construction material, thereby contributing to the reduction of embodied carbon in public infrastructure projects.

3 – RESULTS AND DISCUSSION

Framework

The framework developed by the project is shown in Figure 1. The framework itself is very generalised as the procurement process for each project is unique. The boxes at the top indicate the tendering process and the remaining boxes highlight the different decision steps taken during the process. The decision factors depend on multiple decision choices, but it has been narrowed down to behaviour, policy and resources for this framework.

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Each variable is highlighted by a generalised decision step.

The orange boxes show the tendering process which starts with preparations of tender documents and setting award criteria. As highlighted by the framework below, most of the decisions regarding the nature of the tender are made before a call for tender is made. Aloha et al [6] states early stakeholder engagement, market dialogue, and risk management are essential in conducting innovative GPP. This emphasizes the critical role of the design phase in the procurement process, as decisions made at this stage ultimately determine the extent to which the tender aligns with green procurement principles. In addition, Rosell [7] states that when a contracting authority employs external experts in the contracting process, GPP increases.

This is crucial stage for promoting timber in construction as stages like “setting technical criteria” could be utilised to make it mandatory to use timber in construction. In addition, other variables such as setting green criteria, ecolabels and certification target could indirectly promote timber construction as contractors would look at alternatives to achieve better carbon “metrics.” These metrics could involve carbon emissions throughout a lifecycle of a project.

Life cycle assessment (LCA) and Life cycle costing (LCC) are popular tools associated with GPP, especially as lifecycle assessment is mentioned withing the definition of GPP. LCA used alongside LCC could be a powerful tool to evaluate public tenders as environmental costs would be integrated alongside traditional costs over the lifecycle of the project. However, as Ge et al. [8] highlighted, there are challenges in adoption of LCA for wood construction, with some of these highlighted for Ireland. Many entities are actively addressing these challenges, which include a lack of robust methodology at national level and the need for further development of Environmental Product Declarations (EPD) for more timber products used in Ireland. Furthermore, carrying out the LCC requires experience and competence. However, the sector appears not to have fully matured [9]. In addition, carbon tools, a broad variable looking at carbon accounting, monetising or impact assessment, could also be utilised alongside LCA and LCC to ensure a more robust evaluation for the awarding stage of tender. This evaluation framework could incorporate the monetisation of carbon emissions, facilitating their systematic assessment within the "Most Economically Advantageous Tender" (MEAT) approach, which provides greater flexibility for integrating environmental considerations as part of award criteria [10].

However, setting rigid requirements may hinder innovation and reduce the bids at the “call for tender” stage as most contractors won’t be able to meet the stringent requirements. In addition, Kadefors et al [10] found both collaborative contracts and performance-based contracts only motivate innovation in a single project, while many innovations need systemic innovation processes that span over longer time and several projects. Hence, it’s crucial to make the right decisions before any technical specification, selection criteria or any contract performance clauses (CPC) are set. Rainville [11] recommends the implementation of

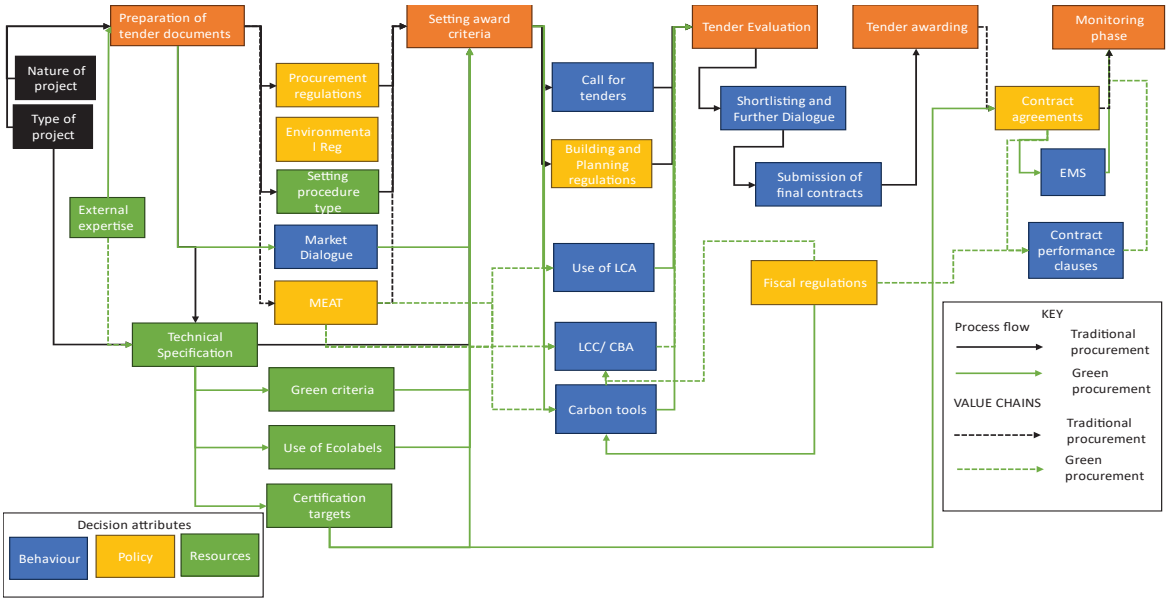

Figure 1: Generalised framework for GPP

(LCA: Life cycle assessment, CBA: Cost Benefit Analysis, MEAT: Most economically advantageous tender, EMS: Environmental Management System)

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mechanisms to enhance the integration of voluntary standards within tendering processes, thereby fostering greater competition for sustainability among suppliers in the construction sector.

Figure 2 highlights a generalised stakeholder framework developed alongside the procurement framework to understand the effects of variables mentioned in figure 1. The framework looks at the relationship between the client and other stakeholders such as consultants, contractors, and subcontractors. Stakeholders can be barriers or drivers of GPP [6]. In addition, the framework represents how different government levels interact with other stakeholders in a public procurement system model and hence gives an insight to how different public bodies could help regulate and implement GPP through policy.

This approach may involve the implementation of different procurement procedures and the integration of market dialogue, both of which are critical in assessing the extent to which a tender aligns with green procurement objectives. Facilitating further dialogue with the contractors and providing opportunities for resubmission following the initial tender evaluation can enhance the effectiveness of proposed solutions and stimulate innovation.

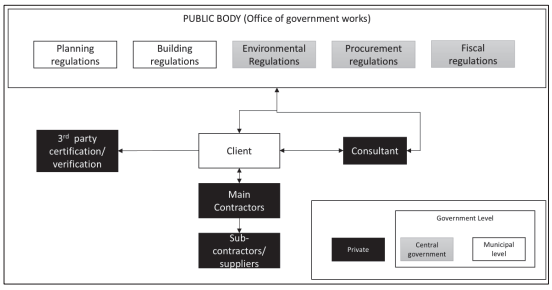

Figure 2. Stakeholder Framework

Developing a list of services and products

Public procurement serves as a strategic instrument for driving sustainability in the construction sector by influencing production and consumption patterns toward more environmentally responsible practices. Through the stimulation of innovation across the supply chain and the promotion of product and service diversification [12], procurement policies can accelerate the adoption of sustainable materials, such as timber, as a renewable and low-carbon alternative. This approach not only enhances resource efficiency but also fosters a market shift towards environmentally conscious construction solutions, ultimately contributing to a more sustainable built environment.

The procurement of products and services below full tendering thresholds necessitates a comprehensive inventory of environmentally conscious suppliers and offerings, particularly in the context of timber-based construction. This approach ensures that even lower-value procurements align with sustainability objectives and minimize environmental impact throughout their production and manufacturing processes. In the realm of timber construction, such a list becomes crucial for promoting the use of sustainable, locally sourced wood products and innovative engineered timber solutions.

The development of this inventory not only streamlines the procurement process for items below tendering thresholds but also supports the broader goals of GPP in the construction sector. By incorporating timber-centric products and services, this approach aligns with Ireland's national objectives to increase the use of home-grown timber and decarbonize the built environment. Furthermore, it facilitates the selection of suppliers and products that demonstrate compliance with environmental standards, sustainable forestry practices, and low carbon manufacturing processes, thereby contributing to the reduction of embodied carbon in public infrastructure projects.

This strategic approach to procurement supports the government's efforts to create and foster a market for more sustainable and low-carbon solutions in construction, particularly emphasizing the role of timber as a renewable and environmentally beneficial building material. By integrating such considerations into all levels of procurement, including those below full tendering thresholds, public authorities can significantly influence market trends towards more sustainable practices in the construction industry.

This section elucidates the rationale behind the inclusion of particular items, emphasizing their potential impact on sustainability. It systematically addresses the challenges encountered during the compilation process. This rationale is firmly anchored in the key sustainability criteria established during the methodology phase, such as embodied carbon, energy efficiency, and resource conservation.

The list is structured into two primary groups, namely Services and Products, which are further categorized into relevant subgroups, including materials, equipment, and energy-efficient technologies. Each category is systematically subdivided to provide a comprehensive overview of the green products and services available in the market.

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The list of services is divided in 12 different service categories as shown in Figure 2.

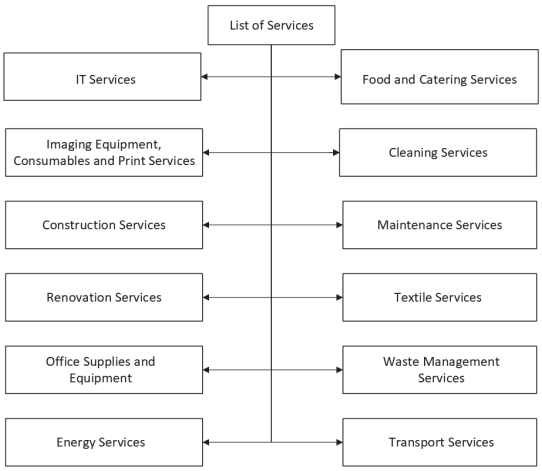

Figure 3: List of Services

The inclusion of each product or service in the list is determined by its demonstrated environmental and/or social sustainability benefits. For instance, the incorporation of recycled content in building materials reduces reliance on virgin resources and minimizes waste generation. Similarly, energy-efficient lighting systems lower energy consumption and associated greenhouse gas emissions, thereby contributing to broader sustainability objectives.

The list of products is further divided in 15 different categories as shown in Figure 4 depending on the type of material and their functionality.

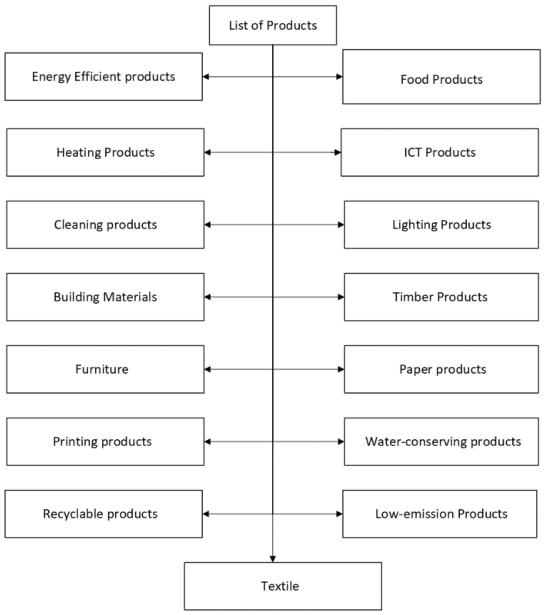

Figure 4: List of Products

The integration of the listed products and services has the potential to substantially enhance sustainability within the construction sector. The selection of green products and services facilitates the reduction of environmental impact, optimizes resource efficiency, and supports the transition towards a more sustainable built environment. In particular, the adoption of timber as a renewable construction material plays a crucial role in lowering embodied carbon, promoting circular economy principles, and advancing climate-resilient building practices.

Several challenges emerged during the compilation process, including cost considerations, the limited availability of sustainable products from suppliers, and a skills gap in green construction practices. These barriers underscore the necessity for targeted policy interventions and industry-wide capacity-building initiatives to facilitate the broader adoption of GPP within Ireland's construction sector. Additionally, the restricted availability of GPP-compliant products and services in the Irish market further hinders the transition toward sustainable construction. In particular, the procurement of timber as a renewable and low-carbon building material remains constrained by supply chain limitations and a lack of widespread expertise in timber-based construction methodologies.

To address these challenges, several strategic interventions are proposed:

Capacity Building Programs: Implementing targeted training initiatives for construction professionals to enhance their expertise in sustainable construction practices, with a particular focus on timber as a renewable and low-carbon material.

Government Incentives: Introducing financial incentives, such as tax reliefs and subsidies, to encourage construction companies to integrate Green Public Procurement (GPP) criteria into their projects. This also includes mandating a percentage of public buildings to be constructed using timber.

Knowledge Sharing: Facilitating collaboration among stakeholders through knowledge-sharing platforms to disseminate best practices and foster innovation in sustainable construction, particularly in the use of timber-based technologies.

These recommendations underscore the critical role of GPP in advancing sustainability within Ireland's construction sector. By systematically selecting and incorporating environmentally responsible products and services, construction projects can contribute to reducing

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environmental impact, conserving resources, and promoting long-term sustainability. Overcoming existing barriers and implementing t0hese proposed solutions will be essential for the successful mainstreaming of GPP, ultimately fostering a more climate-resilient and resource-efficient built environment.

Ensuring the accessibility and user-friendliness of the GPP-compliant product and service list is essential for its effective adoption by key stakeholders, particularly local authorities. This section examines potential hosting platforms and functional enhancements aimed at promoting transparency and facilitating informed decision-making within the public infrastructure procurement process. The successful implementation of this list depends on equipping public authorities, contractors, and suppliers with the necessary resources to make well-informed choices that advance sustainability in the built environment. In particular, prioritizing timber as a renewable and low-carbon construction material within procurement frameworks can further support the transition towards environmentally responsible construction practices.

This study serves as a foundation for further discourse and policy development on GPP implementation in Ireland's public infrastructure sector. By presenting a comprehensive list of GPP-compliant products and services, identifying key challenges, and proposing actionable solutions, this research aims to support the transition towards a more sustainable construction industry, with an emphasis on the critical role of timber as a sustainable and renewable building material.

Ensuring the accessibility and user-friendliness of the GPP-compliant product and service list is essential for its effective adoption by key stakeholders, particularly local authorities. This section examines potential hosting platforms and functional enhancements aimed at promoting transparency and facilitating informed decision-making within the public infrastructure procurement process. The successful implementation of this list depends on equipping public authorities, contractors, and suppliers with the necessary resources to make well-informed choices that advance sustainability in the built environment. In particular, prioritizing timber as a renewable and low-carbon construction material within procurement frameworks can further support the transition towards environmentally responsible construction practices.

The effectiveness of the GPP-compliant product and service list is contingent upon its ability to remain current and responsive to advancements in sustainable construction practices. A dynamic and adaptive approach is essential to ensure the list continues to facilitate the integration of the most innovative and environmentally responsible solutions. This necessitates consideration of key factors such as technological advancements, regulatory updates, and the emergence of sustainable construction materials, with particular emphasis on timber due to its potential as a renewable, low-carbon alternative.

Regular updates to the GPP product and service list are imperative to incorporating the latest advancements in sustainable technologies, expanding product availability, and addressing evolving market trends. Ensuring its continued relevance enhances its value as a strategic resource for procurement professionals, contractors, suppliers, and policymakers, thereby strengthening the implementation of green public procurement. By continuously refining the list based on emerging sustainability criteria and fostering engagement with key stakeholders, it can serve as a robust tool for promoting sustainable procurement practices and advancing the transition towards a low-carbon built environment in Ireland.

6 – CONCLUSION

This study explores GPP as a policy tool for enhancing the adoption of timber products within the Irish construction sector. Through the development of a generalised framework and a list of products and services, the research provides a structured approach to evaluating GPP's potential to drive sustainable procurement practices in the industry.

The research framework highlighted the importance of the decision taken even before the tender documents are prepared. It shows the importance of the decisions made by the client and the procurement team especially while setting technical specifications and award criteria can have on the overall nature of the tender.

In addition, the framework highlights different aspects through which timber products may be promoted in the procurement process. This approach might utilise the incorporation of technical specifications and award criteria, enabling the monetization of carbon emissions to facilitate their assessment alongside costs throughout the project's lifecycle.

The research also looks into stakeholders and the use of market dialogue and different procurement procedures type. It highlights the importance of communication between client and contractors to meet tender requirements while fostering innovation.

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Furthermore, this research has been driven by the pressing need to address sustainability challenges in the construction sector and advance environmentally responsible practices. A comprehensive inventory of GPP-compliant products and services has been systematically developed, categorized according to project phases and specific applications, to equip public entities with the necessary resources for informed procurement decisions.

Recognizing the importance of accessibility and transparency, potential hosting platforms were assessed, with dedicated web-based platforms and government website integration identified as effective mechanisms for dissemination. Furthermore, the critical necessity of continuous refinement was emphasized, proposing structured mechanisms for periodic updates to incorporate advancements in sustainable construction technologies, the introduction of innovative green materials—particularly timber as a renewable and low-carbon alternative—and evolving GPP criteria. Ensuring the dynamic adaptation of this list is essential to maintaining its relevance as a strategic resource for fostering sustainable public infrastructure development.

The effective implementation of GPP in the public infrastructure sector requires a concerted effort among policymakers, public authorities, and construction industry stakeholders. By providing a structured and continually evolving GPP-compliant product and service inventory, this research aims to support the transition toward a more sustainable built environment in Ireland, reinforcing the role of timber and other low-impact materials in achieving climate-conscious construction practices.

While the research work includes a broad literature review and made generalised framework for procurement, the project aims to go a step further and map out the innovation systems map of the Irish construction industry. Furthermore, the project will be utilising an Input-Output model to quantify the difference between using GPP when compared to traditional procurement in the construction industry. The model also aims to establish a cost benefit analysis (CBA) tool that considers carbon emissions and social costs alongside economic costs for constructions project.

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