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PUBLIC PROCUREMENT OF GREEN BUILDINGS

WITH A FOCUS ON ENERGY EFFICIENCY IN PUBLIC BUILDINGS

ABSTRACT

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Abstract:

In the context of global challenges related to climate change and resource depletion, the construction sector plays a crucial role in mitigation and adaptation efforts. Buildings, in particular, are responsible for a significant portion of global energy consumption and greenhouse gas emissions, thus representing a key area for sustainability interventions. Within this framework, the public sector, through its unique position as a major owner and procurer of buildings, holds both the opportunity and responsibility to catalyze the transition towards a more sustainable built environment.

This doctoral thesis focuses on the fundamental role of public policies and green public procurement (GPP) in promoting energy efficiency (EE) in public buildings within the European Union (EU), with a specific emphasis on the context of Eastern European countries, particularly Romania. This geographical focus is justified by the existence of distinct challenges in the region, including a predominantly energy-inefficient building stock, limited financial resources, and reduced awareness of the importance of sustainability among key actors.

The research addresses a significant gap in the existing literature regarding the implementation of policy instruments and public procurement in the Eastern European context. By adopting an interdisciplinary perspective, combining elements from public administration, environmental policy, construction management, and sustainability studies, the thesis provides a comprehensive analysis of the complex interactions between the legislative framework, market dynamics, and stakeholder behavior in the field of EE in public buildings.

The main research objectives include: analyzing the evolution of sustainability concepts in construction and identifying market failures that impede EE; examining sustainable construction and EE policies at the EU level, with emphasis on implementation in Eastern Europe; assessing the level of awareness and readiness for implementing nearly zero-energy buildings (nZEB) in Romania; conducting a comparative analysis of EE policies and practices in public buildings across selected Eastern European cities; evaluating the potential of GPP in promoting EE; and developing recommendations for GPP criteria adapted to the Romanian context.

To achieve these objectives, the thesis adopts a rigorous and multifaceted methodology. The mixed research design integrates qualitative methods, such as document analysis, case studies, and in-depth interviews, with quantitative methods, including analysis of building stock data and online questionnaires. This approach allows for robust data triangulation and provides a holistic perspective on the studied phenomenon. Data analysis combines sophisticated thematic analysis techniques, assisted by NVivo software, with descriptive statistical analyses performed in Excel, thus ensuring a comprehensive and nuanced examination of the results.

The importance of this research lies in its potential to inform both theory and practice in the field of EE policies and sustainable public procurement. From an academic perspective, the thesis contributes to advancing the theoretical understanding of policy implementation in complex multi-level governance systems, while also offering valuable insights into the role of public procurement as a policy instrument in the transition towards sustainability. On a practical level, the research

results will provide evidence-based recommendations for designing and implementing more effective policies and procurement strategies to promote high-performance public buildings.

By focusing on the specific Eastern European and Romanian context, the thesis underscores the critical importance of tailored approaches in formulating and implementing EE policies and GPP practices. This nuanced perspective allows for the identification and addressing of region-specific barriers, thus contributing to the development of more effective strategies better adapted to local realities.

Ultimately, the research aims to demonstrate how the public sector can strategically utilize policy instruments and procurement processes to stimulate substantial progress in EE and sustainability of the built environment. Through this, the thesis aspires to contribute to the broader efforts of the EU in reducing the carbon footprint of the construction sector and achieving ambitious climate and energy goals. The implications of this research extend beyond the academic context, offering valuable information and analyses for policy makers, public procurement specialists, and other stakeholders involved in the transition towards a more sustainable and energy-efficient built environment.

Chapter 3: Sustainability Concepts and the Construction Industry

Chapter 3 serves as the conceptual cornerstone of this thesis, providing an in-depth analysis of the evolution and application of sustainability concepts in the construction industry. This exploration is fundamental to understanding the context in which EE policies and GPP practices are developed in the construction sector.

The primary objective of this chapter is to trace the historical development of sustainability concepts and examine their integration into construction practice and theory. The adopted methodology is predominantly qualitative and interpretative, combining chronological and comparative analyses to offer a holistic perspective on the subject.

The analysis is structured around three main components:

1. Chronological Evolution of Sustainability Concepts: This traces the trajectory of sustainability thinking, from pre-modern approaches to contemporary conceptualizations, highlighting pivotal moments and paradigm shifts.
2. Comparative Analysis of Sustainability Models: Various theoretical frameworks are critically examined, including ecological economics, strong sustainability, socio-ecological systems theory, the planetary boundaries concept, and doughnut economics.
3. Evaluation of Application in the Construction Industry: This component analyzes how sustainability concepts have been translated into concrete practices in the construction sector, assessing their effectiveness and identifying areas for improvement.

While the analysis adopts a global perspective, special attention is given to the EU context, reflecting the geographical focus of the thesis. This approach allows for a nuanced examination of

how sustainability concepts are interpreted and applied within construction policies and practices at the European level.

The chapter concludes by emphasizing its contribution to the in-depth understanding of the sustainability concept in the specific context of the construction industry. The solid theoretical foundation established here serves as a basis for subsequent analyses of EE policies, stakeholder behavior, and the potential of GPP in promoting sustainable construction practices.

Through this analysis, Chapter 3 not only provides the necessary conceptual context for the rest of the thesis but also highlights the complexity and multidimensionality of sustainability challenges in the construction sector. This nuanced understanding is essential for the critical evaluation of current policies and for formulating informed recommendations regarding the implementation of GPP and the improvement of EE in public buildings, central themes of the following chapters.

Chapter 4: Identifying Sustainability Challenges in the Construction Industry

Building upon the theoretical foundations established in Chapter 3, this chapter examines the specific sustainability challenges within the construction industry, focusing on market failures that impede EE in public buildings. By transitioning from a broad overview of sustainability concepts to a focused analysis of the construction sector's impact, this chapter lays the groundwork for understanding the barriers that must be addressed to enhance EE through GPP in the EU.

Employing an integrative literature review methodology, the chapter synthesizes findings from diverse disciplines to address the complex and multidisciplinary nature of sustainability challenges and market failures in the construction industry. The scope is deliberately concentrated on the intersection of market failures, public buildings, and EE. This focus is justified by the significant potential for energy savings in the public building sector and the unique role of public authorities in driving sustainable construction practices.

The theoretical framework integrates multiple perspectives:

- Market Failure Theory: Analyzes market imperfections leading to suboptimal investment in sustainable construction, such as information asymmetry, split incentives, and externalities.
- Transaction Cost Economics: Examines organizational and institutional barriers that increase the costs of implementing sustainable practices.
- Stakeholder Theory: Investigates the complex network of stakeholders in the construction industry, whose varied interests and influences affect sustainability outcomes.
- Socio-Technical Systems Theory: Explores the interplay between technical, organizational, and institutional dimensions, highlighting systemic challenges in adopting energy-efficient practices.

The construction industry significantly impacts global sustainability, being a major contributor to greenhouse gas emissions, resource consumption, and waste generation. Unsustainable patterns

in construction activities contribute to environmental degradation and resource depletion, impeding climate change mitigation goals. This underscores the urgent need for a paradigm shift toward low-carbon, resource-efficient practices within the industry.

Market failures play a pivotal role in perpetuating unsustainable practices. Information asymmetry hinders consumers and investors from making informed decisions due to a lack of reliable data on EE and environmental performance. Split incentives occur when the benefits of EE investments do not accrue to the investor, dissuading them from investing. Externalities, such as environmental costs not reflected in market prices, lead to overconsumption of resources and environmental harm. These inefficiencies necessitate state intervention to promote sustainable construction.

Government actions can include:

- Regulations and Standards: Mandating minimum energy performance levels through building codes and EE standards.
- Financial Incentives: Offering subsidies, tax breaks, and other incentives to encourage investment in energy-efficient technologies and practices.
- Information and Awareness Campaigns: Educating stakeholders about the benefits of EE and providing guidance on implementing sustainable practices.

The construction industry's specific characteristics further complicate sustainability efforts. Its project-based nature involves complex supply chains and multiple stakeholders, making standardized approaches challenging. The dominance of small and SMEs, often with limited resources and expertise in sustainability, impedes widespread adoption of innovative practices. Additionally, the long lifespans of buildings mean decisions made during construction have enduring environmental impacts.

Effective interventions must be tailored to these unique characteristics. Strategies such as engaging SMEs, facilitating knowledge transfer, and promoting lifecycle thinking are crucial for driving change within the sector. Recognizing these challenges sets the stage for a focused examination of the public sector's role in promoting sustainable construction.

Concluding this chapter, the emphasis shifts toward the potential of public authorities as catalysts for sustainability. As the largest building owners and significant drivers of construction demand, public authorities have the capacity to lead by example. Through their procurement practices and regulatory frameworks, they can influence market dynamics and promote the adoption of energy-efficient practices. This transition prepares the groundwork for subsequent chapters, which will explore specific policy levers available to public authorities—such as GPP—to overcome market failures and advance EE in public buildings.

Chapter 5: Sustainable Construction and Green Buildings—Concepts, Benefits, and Challenges

Transitioning from the broader sustainability challenges identified in the construction industry, this chapter delves into the specific concepts of sustainable construction and green buildings. Building upon the understanding of market failures impeding EE in public buildings discussed in Chapter 4, this chapter provides a comprehensive exploration of sustainable construction practices, their evolution, and their multifaceted implications. This focus is crucial for establishing criteria for assessing EE measures in buildings, which will be further developed in subsequent chapters.

Employing a mixed-method approach that combines a narrative literature review with a systematic review following PRISMA guidelines, the chapter thoroughly examines the development of sustainable construction and green building concepts. This methodology ensures a holistic understanding of the environmental, economic, and social advantages of these practices, setting a strong foundation for promoting high-performance, sustainable building initiatives.

The scope encompasses sustainable construction, green buildings, and high-performance buildings, emphasizing their lifecycle aspects. By addressing the complex nature of sustainable construction, the chapter assesses both the potential benefits, and the challenges associated with implementing green building practices. This broad examination is justified by the need to understand the comprehensive value of sustainable construction beyond mere financial considerations.

The theoretical foundation draws on multiple frameworks that provide a multidimensional lens through which to evaluate sustainable construction and green buildings:

- Sustainability Theory underscores the integration of environmental stewardship, economic viability, and social responsibility.
- Life Cycle Assessment (LCA) offers a method to quantify environmental impacts throughout a building's entire lifecycle.
- Green Building Certification Systems, such as LEED and BREEAM, establish standardized criteria and benchmarks for sustainable design and construction.
- The Triple Bottom Line (TBL) Approach evaluates performance based on environmental, social, and economic dimensions.

Tracing the evolution of sustainable construction, the chapter highlights the progression from early environmentally responsible building practices to the formalized notion of green buildings. Initially, efforts focused on minimizing resource depletion by using locally sourced materials and reducing waste, reducing energy consumption through passive design strategies, and protecting indoor environmental quality with non-toxic materials and proper ventilation.

These early concepts coalesced into the more defined concept of green buildings, which are designed to minimize environmental impact throughout their entire lifecycle—from construction and operation to demolition and disposal. Key principles of green building design include:

- Energy Efficiency: Incorporating technologies and strategies such as high-performance windows, insulation, efficient lighting, and renewable energy systems to reduce energy consumption.
- Water Conservation: Minimizing water use through efficient fixtures, rainwater harvesting, and water-efficient landscaping.
- Material Conservation and Waste Reduction: Prioritizing durable, recyclable, and locally sourced materials to reduce waste and transportation impacts.
- Indoor Environmental Quality: Enhancing occupant health and comfort through natural ventilation, daylighting, and the use of non-toxic materials.

The implications of adopting sustainable construction and green building practices are wide-ranging:

- Environmental Benefits: Reduction in resource consumption, greenhouse gas emissions, and waste generation contributes to environmental protection and climate change mitigation.
- Economic Benefits: Lower energy and water costs, increased property values, and reduced operating and maintenance expenses offer significant economic advantages.
- Social Benefits: Healthier indoor environments, job creation in the green building sector, and improved community resilience enhance social well-being.

By employing theoretical frameworks like LCA and TBL, alongside certification systems, the chapter provides standardized approaches to assess and recognize the sustainability performance of buildings. These tools are instrumental in quantifying environmental benefits and illustrating practical applications, thereby reinforcing the rationale for promoting sustainable construction practices.

In conclusion, Chapter 5 reinforces the critical role of the construction industry in addressing global sustainability challenges. It emphasizes that adopting green building practices is essential for mitigating environmental impacts and fostering a healthier, more resilient built environment. This chapter sets the stage for subsequent discussions on specific strategies and methodologies for achieving sustainable construction, aligning with the thesis's central theme.

Chapter 6: EE in Green Buildings and Stakeholder Analysis

Chapter 6 transitions from conceptual discussions to a practical exploration of EE in green buildings within the EU, focusing on the role of the public sector. Recognizing the critical importance of energy consumption for building sustainability, this chapter analyzes technological approaches to EE, maps involved stakeholders, identifies existing barriers, and examines relevant policies.

The adopted methodology combines quantitative and qualitative approaches, integrating systematic literature reviews, content analyses, policy analyses, and case studies. This mixed

approach facilitates a nuanced analysis of the technological, institutional, and human factors influencing EE outcomes.

The chapter explores technological solutions for improving EE in buildings, emphasizing that technological advancements alone are insufficient. Successful implementation of EE measures requires active collaboration among various stakeholders.

A key contribution is the comprehensive stakeholder mapping, based on the Horizon 2020 iBRoad project. Sixteen distinct stakeholder groups are identified at EU and member state levels, including decision-makers, building owners, architects, engineers, contractors, financial institutions, and end-users. The analysis of their roles and influence elucidates the complexity of relationships affecting EE initiatives.

Barriers to EE are systematically categorized into six main groups: strategic and legislative, institutional, market and financial, knowledge and capacity, industry structure and procurement, and digitalization and regional, local, and cultural factors. By correlating each barrier category with specific stakeholder groups, the chapter underscores the importance of targeted interventions addressing the unique challenges faced by different actors in the construction ecosystem.

For policy analysis, the chapter introduces frameworks such as the Policy Cycle Analysis and the Advocacy Coalition Framework (ACF). These provide insights into the development and implementation processes of EE policies.

Building on identified stakeholder needs and barriers, the chapter maps successful policy instruments promoting energy-efficient and low-carbon buildings. These policies are categorized into regulatory, financial, informational and awareness, qualification, market-based, and voluntary and collaborative measures. The importance of a holistic approach integrating multiple instruments for maximum effectiveness is emphasized.

The chapter highlights the crucial role of public authorities as building owners and market influencers. The public sector's procurement practices and regulatory frameworks uniquely position it to lead by example in promoting sustainable construction.

In conclusion, Chapter 6 serves as a bridge between theoretical foundations and practical strategies for implementing EE. The detailed analysis of technological approaches, stakeholder dynamics, barriers, and policy frameworks establish the basis for subsequent discussions on GPP to achieve sustainable outcomes in the built environment.

Chapter 7: A Deep Dive into the EU's EE Framework for Buildings

This chapter marks a critical juncture in the thesis, transitioning from theoretical explorations and stakeholder analyses to a comprehensive examination of the EU's regulatory framework governing EE in buildings.

The methodology employed combines legal analysis, policy evaluation, comparative studies, and case analyses. The chapter begins by elucidating the EU's ambitious vision for climate neutrality by

2050, highlighting cornerstone initiatives such as the European Green Deal and the "Fit for 55" package. These policies underscore the EU's commitment to a low-carbon future and set the strategic context for subsequent regulatory developments.

The analysis focuses on the Energy Performance of Buildings Directive (EPBD), tracing its evolution from its inception in 2002 through successive revisions. It illustrates how the EPBD has progressively tightened EE standards, introducing concepts like nZEBs and, more recently, Zero-Emission Buildings (ZEBs) and whole-life carbon assessments.

Complementing the EPBD analysis, the chapter examines the Energy Efficiency Directive (EED) and its amendments, emphasizing the EU's shift from voluntary agreements to a legally binding framework. This shift reflects an increasing recognition of the urgent need to enhance EE across all sectors, with buildings playing a pivotal role.

The chapter then delves into the Public Procurement Directives (2014/23/EU, 2014/24/EU, and 2014/25/EU), highlighting how public procurement serves as a powerful instrument for integrating environmental considerations into procurement processes. By emphasizing principles of transparency, equal treatment, and the pursuit of the most economically advantageous tender, these directives enable public authorities to drive market demand for sustainable building products and services.

The EU's GPP criteria specific to buildings are explored in detail, providing an in-depth analysis of technical specifications encompassing use-stage energy consumption, passive design features, energy-efficient equipment, building energy management systems, and whole-life carbon assessments.

To anchor the discussion within a national context, the chapter presents a case study of Romania, examining how EU directives have been implemented within its public procurement legal framework and institutional structures. It acknowledges positive developments, such as increased adoption of simplified procedures, but also identifies persistent challenges, including transparency concerns and the need for capacity building among contracting authorities.

In conclusion, the chapter underscores that while significant progress has been made at both EU and national levels, substantial challenges remain in fully harnessing public procurement's potential to drive sustainable construction. It advocates for a more strategic, ambitious, and enforceable GPP framework, emphasizing the necessity of a holistic approach that integrates environmental, social, and economic considerations throughout a building's lifecycle.

This chapter establishes a critical foundation for subsequent analyses by providing a detailed understanding of the EU's legal and policy frameworks. It bridges the gap between theoretical constructs and practical implementation, illustrating how regulatory mechanisms can be leveraged to overcome market failures identified in earlier chapters.

Chapter 8: EE in Romania's Public Buildings—A Case Study

Building upon the analysis of the EU's EE framework in Chapter 7, Chapter 8 provides an in-depth examination of Romania's current landscape regarding EE in public buildings. This chapter is pivotal in offering empirical evidence on the actual state of Romania's public building stock and exploring the underlying reasons for its energy performance levels. By focusing on the specific context of Romania, the chapter aligns with the thesis's first workstream: public policy for EE in public buildings.

Employing a mixed-methods approach, the chapter integrates quantitative data analysis of building stock characteristics with qualitative insights from comprehensive surveys and in-depth interviews with key stakeholders, including developers and procurement specialists. This methodology allows for a nuanced understanding of both the measurable aspects of EE and the perceptions, awareness, and strategies of those directly involved in implementing nZEB standards.

The quantitative analysis reveals that a significant portion of Romania's public building stock is energy-inefficient, with many structures inherited from the socialist era exhibiting poor thermal performance and outdated systems. The uptake of green building certifications such as BREEAM and LEED is relatively low and predominantly concentrated in urban areas, indicating regional disparities in resources, expertise, and market demand for sustainable building practices. These findings underscore the urgent need for EE improvements and highlight the challenges posed by the existing building stock.

The qualitative component of the chapter delves into the perspectives of developers and procurement specialists regarding nZEB implementation. The surveys and interviews identify several key obstacles:

- Lack of Awareness and Knowledge: There is a significant gap in understanding nZEB standards and their practical application among both developers and procurement officials. This lack of knowledge hinders the adoption of energy-efficient practices.
- Financial Constraints: The perceived high upfront costs associated with nZEB construction and renovation deter investment, despite the potential for long-term energy savings. Limited access to financing mechanisms exacerbates this issue.
- Shortage of Skilled Professionals: There is a limited availability of professionals with the technical expertise required for designing, constructing, and managing nZEB buildings, impeding the implementation of advanced EE measures.
- Ambiguities in Policy and Regulation: Unclear public procurement criteria and inconsistencies in policy implementation create uncertainties, making it challenging for stakeholders to comply with EE requirements.

These obstacles illuminate why Romania's public building stock remains largely energy-inefficient and emphasize the importance of targeted interventions. The chapter highlights that, despite these challenges, Romanian authorities have demonstrated a commitment to meeting EU’s EE targets.

There is a gradual increase in the adoption of nZEB principles in new public building projects, indicating positive progress.

To address the identified challenges, the chapter advocates for a multifaceted approach:

- Enhancing Knowledge and Capacity: Implementing educational initiatives and capacity-building programs for developers and procurement officials can bridge the knowledge gap and promote best practices in EE.
- Financial Support Mechanisms: Introducing subsidies, tax incentives, and accessible financing options can alleviate financial barriers and encourage investment in nZEB projects.
- Clarifying Policy and Procurement Criteria: Establishing clear, consistent, and enforceable public procurement criteria that prioritize EE can provide direction and certainty for stakeholders.
- Developing Technical Expertise: Investing in training and certification programs can expand the pool of skilled professionals capable of delivering high-quality nZEB projects.

Chapter 8 is instrumental in connecting the thesis's exploration of EU-level policies with the ground realities in a member state. By providing empirical evidence of the current situation in Romania, the chapter underscores the necessity of contextualizing EE initiatives within national frameworks. It demonstrates that achieving significant improvements in public building energy performance requires not only adherence to EU directives but also tailored strategies that address local challenges and leverage specific opportunities. This understanding is crucial for developing practical GPP strategies in Romania, directly contributing to the thesis's goal of promoting sustainable public procurement and advancing EE in the built environment.

Chapter 9: Navigating the Path to Urban EE—A Cross-City Analysis

Chapter 9 provides empirical evidence on public policies for EE in public buildings, focusing on five Eastern European cities: Riga, Budapest, Cluj-Napoca, Bucharest (Sector 2), and Alba Iulia. It examines the practical implementation of nZEB standards, utilizing extensive secondary data and stakeholder interviews to offer a comprehensive perspective on the challenges and successes in transitioning towards energy-efficient public buildings.

The methodological framework is grounded in the Multi-Level Perspective (MLP) and Multi-Level Governance (MLG) to analyze the transposition of EU directives into national and local policies. The comparative case study approach combines legal analysis, policy review, and interviews, facilitating a comprehensive exploration of the multidimensional challenges in pursuing building EE.

The analysis is structured around four main themes:

1. Policy evolution and regulatory frameworks
2. Technical approaches and innovations
3. Financing mechanisms and economic incentives
4. Stakeholder engagement and capacity building

Findings from this analysis underscore the pivotal role local governments play in translating national policies into actionable nZEB projects, while variations in technical expertise, funding availability, and energy performance data significantly shape implementation outcomes across cities. Strong political commitment, effective administrative capacity, and proactive stakeholder engagement emerge as critical drivers for efficient adoption, with robust data availability serving as a cornerstone for informed policy enforcement and adaptation. Governance structures—both vertical (EU–national) and horizontal (across municipalities)—further influence the diffusion of innovations, yet persistent challenges in retrofitting aging buildings, financial constraints, and capacity gaps continue to complicate progress toward nZEB standards.

The chapter directly contributes to the thesis's first workstream by providing empirical evidence on policy implementation at the urban level. Indirectly, it also informs the second workstream by highlighting local factors that influence procurement decisions and the adoption of energy-efficient technologies.

In conclusion, the analysis underscores the critical role of integrated multi-level governance in achieving energy efficiency, highlighting not only top-down policy frameworks but also the necessity of strong local leadership, context-specific strategies, and active stakeholder participation. These insights guide the development of adaptive GPP criteria and reinforce the thesis’s central tenet of leveraging public policy as a catalyst for sustainable development in public buildings.

Chapter 10: Public Procurement and GPP of Green Buildings—Unlocking Sustainability Through Strategic Procurement

Chapter 10 examines the role of public procurement in promoting EE and sustainability in the construction sector, focusing specifically on public buildings. Consistent with the thesis’s second workstream— GPP criteria for EE in public buildings—this chapter shows how GPP can extend beyond basic legislative requirements. By drawing on interviews with 30 European experts involved in sustainable building procurement, the chapter illustrates how public authorities can use their purchasing power to influence markets and encourage innovation in construction practices.

Key findings highlight that public procurement has the potential to drive substantial change by incentivizing the development and adoption of sustainable products and services. By setting ambitious GPP criteria, public bodies can stimulate innovation, create market demand for sustainable solutions, and promote the widespread adoption of green building practices. This proactive stance moves beyond adhering to minimum legal requirements, positioning public procurement as a catalyst for industry-wide sustainability advancements.

A significant insight from the chapter is the necessity of adopting a holistic approach to sustainability in procurement. While EE remains crucial, the chapter emphasizes the importance of considering the entire building lifecycle—from material sourcing to end-of-life disposal. This

lifecycle perspective encompasses broader environmental impacts such as resource depletion, waste generation, and the avoidance of hazardous materials. Additionally, it incorporates social considerations like worker health and safety, community engagement, and ethical sourcing practices.

The chapter systematically examines how GPP criteria can be effectively embedded into all stages of the procurement process:

- In the planning and preparation phase, defining needs, conducting thorough market research, and engaging stakeholders are essential for setting ambitious yet attainable sustainability goals.
- The design and specification phase is identified as critical for translating these objectives into concrete, measurable requirements for EE, material use, and waste management.
- During the evaluation and execution phase, innovative assessment methods—such as life-cycle costing and environmental footprinting—are advocated over traditional price-centric evaluations to ensure a comprehensive appraisal of bids.

Despite the potential benefits, the chapter acknowledges several challenges hindering the effective implementation of GPP. These include inconsistencies and gaps in legislation at both EU and national levels, capacity and resource constraints within procurement authorities, and financial and planning obstacles such as budget limitations and short-term planning horizons. To overcome these barriers, the chapter proposes actionable recommendations:

- Simplifying and standardizing GPP guidelines through the development of clear, accessible information, standardized templates, and checklists.
- Investing in capacity building through training programs, knowledge-sharing platforms, and dedicated resources within procurement departments.
- Aligning GPP with strategic goals by integrating it into long-term planning and budgeting cycles.

The final Section 10.3 proposes a GPP criteria framework specifically for new construction or deep renovation of educational buildings in Romania's Climate Zone 3. This proposal stems from stakeholder interviews and observations, drawing inspiration from Latvia's successful implementation of mandatory GPP standards and aligning with emerging EU-level GPP criteria. The framework incorporates both core criteria (recommended as mandatory) and comprehensive criteria designed to exceed standard practices and transition towards Zero Energy Buildings (ZEB), aligning with EPBD and EED directives. This multi-layered approach ensures Romanian educational buildings comply with national and EU sustainability objectives. The framework is divided into four sections: Selection Criteria (evaluating contractors' and designers' expertise in sustainable construction); Technical Specifications and Award Criteria (defining energy performance benchmarks, renewable energy integration, and material sustainability targets for nZEB compliance in Climate Zone 3) and Additional Sustainability Criteria (addressing themes like building

adaptability, biodiversity, and user well-being); Contract Performance Clauses (outlining monitoring and verification requirements for energy and water management, waste reduction, and circularity). In addition, it includes a list of Verification Techniques to confirm compliance, ensuring that both proposals and final outcomes align with the intended objectives.

In conclusion, Chapter 10 calls for a shift from viewing procurement as a compliance exercise to treating it as a strategic, value-oriented process. By adopting the proposed recommendations, public authorities can leverage GPP to encourage innovation, reduce negative environmental impacts, and foster a more sustainable built environment. This aligns with the thesis's overarching goal of demonstrating how tailored GPP criteria support EE and sustainability in public buildings, ultimately contributing to broader climate and development objectives.